

## Repair Manual

Jetta 2011 ➤

Jetta 2015 ➤

**4-Cylinder Direct Injection (1.4L Engine, 4V, EA 211,  
Turbocharger, Hybrid)**

Engine ID	CNL A	CRJA							
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Edition 10.2022





## List of Workshop Manual Repair Groups

### Repair Group

- 00 - General, Technical Data
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- 13 - Crankshaft, Cylinder Block
- 15 - Cylinder Head, Valvetrain
- 17 - Lubrication
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- 21 - Turbocharger, Supercharger
- 24 - Multiport Fuel Injection
- 26 - Exhaust System, Emission Controls
- 28 - Ignition/Glow Plug System



Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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## 00 – General, Technical Data

### 1 Safety Precautions

(Edition 10.2022)

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⇒ [P1.1 recautions when Working on Vehicles with High-Voltage System", page 1](#)

⇒ [P1.2 recautions when Working on Fuel Supply System", page 2](#)

⇒ [P1.3 recautions during Road Test with Testing Equipment", page 2](#)

⇒ [P1.4 recautions when Working on Cooling System", page 3](#)

⇒ [P1.5 recautions when Working on Ignition System", page 3](#)

#### 1.1 Safety Precautions when Working on Vehicles with High-Voltage System

High voltage is extremely dangerous.

The high-voltage system is under high voltage. Electrocutation can cause death or very serious personal injury.

- Individuals with electronic/medical life and health sustaining machines in or on their person cannot perform any work on high-voltage systems. Life and health sustaining machines are for example pain killer pumps, implanted defibrillators, pacemakers, insulin pumps, and hearing aids.
- Have the high-voltage system de-energized by a qualified person.

There is a risk of injury due to the engine starting unexpectedly.

Active drive ready mode is difficult to identify in electric and hybrid vehicles. Parts of the body can be pinched or pulled in.

- Switch off the ignition.
- Place the ignition key outside of the vehicle interior.

There is a risk of damaging the high-voltage cables.

Incorrect handling can damage the insulation on high-voltage cables or high-voltage connectors.

- Never use the high-voltage cables and the high-voltage connectors for support.
- Never support tools on the high-voltage cables and the high-voltage connectors.
- Never sharply bend or kink the high-voltage cables.
- Pay attention to the coding when connecting the high-voltage connectors.





## Safety Precautions when Working near High-Voltage Components

High voltage is extremely dangerous.

The high-voltage system is under high voltage. Electrocution can cause death or very serious personal injury from damaged high-voltage components and high-voltage cables.

- Visually inspect the high-voltage components and the high-voltage cables.
- Never use tools that are for cutting, deformed, or sharp edged.
- Never weld, solder, or use thermal adhesive or hot air.

## 1.2 Safety Precautions when Working on Fuel Supply System

There is a risk of injury due to the fuel being under pressure.

The fuel system is under pressure. Injuries are possible from fuel spraying out.

Before opening the fuel system:

- Wear protective eyewear.
- Wear safety gloves.
- Reduce the pressure: place clean cloths around the connection point and carefully open the connection point.

Leaking fuel increases the risk of fire.

When the battery is connected, the door contact switch activates the fuel pump when opening the driver door. Leaking fuel may ignite and start a fire.

- Before opening the fuel system, cut off the power supply to the fuel pump.



### WARNING

Any type of fuel leak will result in an increased risk of fire.

Do not turn on the ignition, open the front doors, or attempt to start the engine at any time while any part of the vehicle's fuel system is unassembled. Failing to heed this warning could result in fire and personal injury

## 1.3 Safety Precautions during Road Test with Testing Equipment

There is a risk of injury due to unsecured testing equipment.

If the front passenger airbag activates during a collision, unsecured testing equipment becomes a dangerous projectile.

- Secure testing equipment on the rear seat.

or





- Have a second person operate testing equipment on the rear seat.

## 1.4 Safety Precautions when Working on Cooling System

There is a risk of scalding due to hot coolant.

The cooling system is under pressure when the engine is warm.  
There is a risk of scalding due to hot steam and hot coolant.

- Wear safety gloves.
- Wear protective eyewear.
- Reduce the pressure by covering the coolant expansion tank cap with a cloth and carefully opening it.

## 1.5 Safety Precautions when Working on Ignition System

**Risk of injury due to electrocution**

The ignition system is under high voltage when the engine is running. It is possible to be electrocuted by touching the ignition system.

- Never touch or remove the ignition wires when the engine is running or at cranking speed.

**Risk of damaging components**

Washing the engine as well as connecting and disconnecting wires when the engine is running can damage components.

- Switch off the ignition before connecting and disconnecting wires.
- Switch off the ignition before washing the engine.

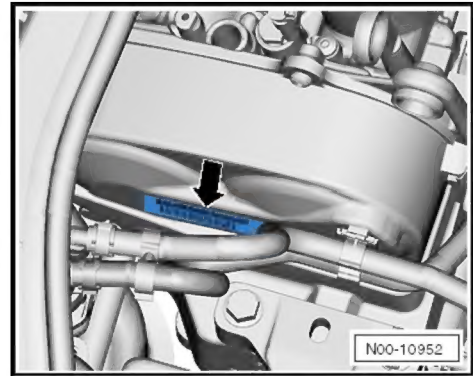


## 2 Identification

⇒ [N2.1 Number/Engine Specifications", page 4](#)

### 2.1 Engine Number/Engine Specifications

The label -arrow- on the upper toothed belt cover lists the engine code and the engine serial number.



The engine code can also be found on the vehicle data label and on the crankcase above the transmission.

The engine number consists of up to nine alphanumeric characters. The first part (maximum three letters) represents the "engine code", the second (six digit) is the "serial number". If more than 999,999 engines with the same engine code are produced, the first of the six characters is replaced with a letter.

#### Vehicles with Four-Letter Engine Codes

Four-digit engine codes beginning with "C" are used. The first three letters describe the mechanical engine structure and are still stamped on the engine, as before. The fourth digit describes the engine output and torque and depends on the Engine Control Module -J623-. The engine codes and engine serial number are located on the type plate, the vehicle data label and on the engine control module.



#### Note

Vehicle data label locations ⇒ [Maintenance; Booklet ; Vehicle Data Label.](#)

Engine Codes		CNLA	CRJA
Manufacturing		from 07/2012	from 12/2012
Emissions values		ULEV2/ SULEV	EU6
Displacement	cm <sup>3</sup>	1395	1395
Output	kW at RPM	110/5000	110/5000
Torque	Nm at RPM	250/1400 to 3500	250/1400 to 3500
Bore	Diameter in mm	74.5	74.5
Stroke	mm	80.0	80.0
Compression ratio		10.5	10.5
Valves per cylinder		4	4



Engine Codes	CNLA	CRJA
Research Octane Number minimum (RON)	95 unleaded (in exceptional cases, minimum 91 RON, but with reduced performance)	95 unleaded (in exceptional cases, minimum 91 RON, but with reduced performance)
Fuel Injection, Ignition System	Motronic MED 17.1.6	Motronic MED 17.1.21.
Ignition sequence	1-3-4-2	1-3-4-2
Secondary Air System	Yes	No





### 3 Repair Information

⇒ [f3.1 or Clean Working Conditions", page 6](#)

⇒ [O3.2 bjects in Engine", page 6](#)

⇒ [C3.3 orrosion", page 6](#)

⇒ [R3.4 outing and Securing", page 7](#)

⇒ [a3.5 nd Condenser Assembly", page 7](#)

⇒ [S3.6 ystem, Checking", page 7](#)

#### 3.1 Guidelines for Clean Working Conditions

Even small pieces of debris can cause faults. Therefore when working on the fuel supply, injection system and turbocharger, pay careful attention to the following rules of cleanliness:

- ◆ Before loosening, the connection points and surrounding areas must be cleaned thoroughly with engine or brake cleaner, and then the cleaned area must be thoroughly dried.
- ◆ Immediately seal off any open lines and connections with clean plugs taken from the Engine Bung Set -VAS 6122-, for example.
- ◆ Place removed parts on a clean surface and cover them with lint-free cloths.
- ◆ Carefully cover or seal opened components if repairs are not performed immediately.
- ◆ Only install clean parts: remove the replacement parts from their packaging just before installing them. Do not use any parts that have been kept out of packaging (for example, in a toolbox).
- ◆ Supplied transport and protective packaging and sealing cover should only be removed immediately before installing.
- ◆ If the system is open, do not work with compressed air and do not move the vehicle.
- ◆ Make sure no fuel gets onto the fuel hoses. If necessary, the fuel hoses must be cleaned again immediately.
- ◆ Protect the disconnected connectors from dirt and moisture and only connect when they are dry.

#### 3.2 Foreign Objects in Engine

To prevent foreign objects from entering when working on the engine, open intake and exhaust tract channels must always be sealed off with suitable plugs, for example from the Engine Bung Set -VAS 6122-.



#### Note

*If there is mechanical damage to the turbocharger. Refer to ⇒ [R1.2 emoving and Installing", page 331](#) .*

#### 3.3 Contact Corrosion

Contact corrosion can occur if incorrect fasteners (bolts, nuts, washers, etc.) are used.





For this reason, only fasteners with a special surface coating may be installed.

Furthermore, only rubber/plastic parts and adhesive made of electrically non-conductive materials are used.

If there are doubts about whether the parts are suitable, then use new parts. Refer to the ➔ Electronic Parts Catalog (ETKA).

### 3.4 Line Routing and Securing

- ◆ Mark the individual fuel, hydraulic and vacuum lines, the EVAP system lines or the wires before disconnecting and/or removing them. This will prevent a mix-up when reconnecting them and will ensure the original installation location is kept.
- ◆ If necessary, draw sketches or take pictures.
- ◆ Due to the limited space inside the engine compartment, allow sufficient clearance to all moving or hot parts to avoid damaging the lines.

### 3.5 Radiator and Condenser Assembly

When assembled correctly, the radiator, condenser and turbocharger may have slight impressions on their slats. This is not damage. Do not replace the cooler, condenser or turbocharger because of impressions like that.

### 3.6 Vacuum System, Checking

#### Special tools and workshop equipment required

- ◆ Hand Vacuum Pump -VAS 6213-



#### Procedure

- Check all vacuum lines in the entire vacuum system for:
  - ◆ Cracks
  - ◆ Damage caused by animals
  - ◆ Pinching
  - ◆ Porous locations and other leaks
- Check the vacuum line leading both to and from the solenoid valve to the respective component.
- If there is a DTC memory entry, check the vacuum lines for the named component, but also all the vacuum lines to the other components.
- If using the Hand Vacuum Pump -VAS 6213- does not produce any pressure or if the pressure drops again right away, then check the hand vacuum pump and the connection hoses for leaks.



## 10 – Engine Assembly

### 1 Engine, Removing and Installing

⇒ R1.1 Removing", page 8

⇒ a1.2 and Transmission, Separating", page 23

⇒ D1.3 Drive Motor V141, Separating from Engine", page 29

⇒ S1.4 Securing to Engine and Transmission Holder", page 39

⇒ E1.5 Electric Drive Motor V141, Attaching to Engine", page 41

⇒ I1.6 Installing", page 65

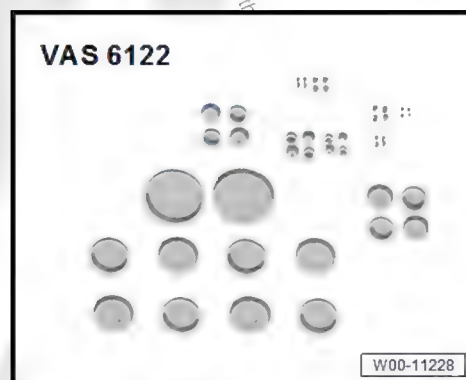
#### 1.1 Engine, Removing

Special tools and workshop equipment required

◆ Used Oil Collection and Extraction Unit -SMN372500-



◆ Engine Bung Set -VAS 6122-



◆ Shop Crane - Drip Tray -VAS 6208-





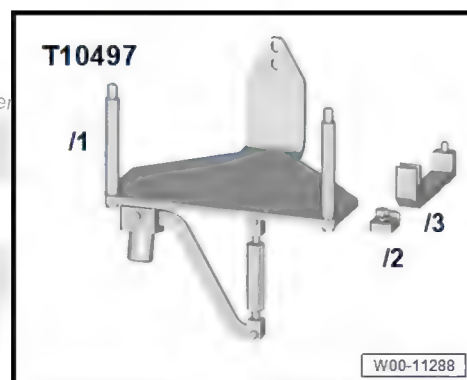
◆ Scissor Lift Table -VAS 6131 B-



◆ Hose Clip Pliers -VAS 6362-



◆ Engine Support -T10497-



◆ Commercially available Step Ladder



◆ Protective Eyewear

◆ Safety Gloves





## Procedure



### Note

- ♦ *The engine is removed downward together with the transmission.*
- ♦ *Secure the rear lid so that it cannot close because the battery is going to be disconnected.*
- ♦ *Access to the luggage compartment when the power is off possible but with difficulty.*

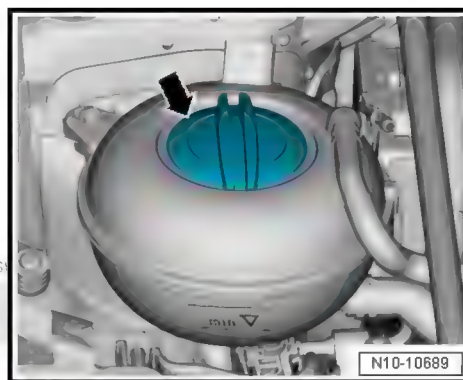
## DANGER

Extremely dangerous due to high-voltage.

Electrocution can cause death or very serious personal injury.

- Have the high-voltage system de-energized by a qualified person.

- Disable the high-voltage system. Refer to ⇒ Electrical Equipment; Rep. Gr. 93; High-Voltage System, Disabling.
- Open the coolant reservoir cap -arrow-.



## CAUTION

The cooling system may be under pressure. There is a risk of scalding due to hot steam and hot coolant.

Scalding the skin and other parts of the body is possible.

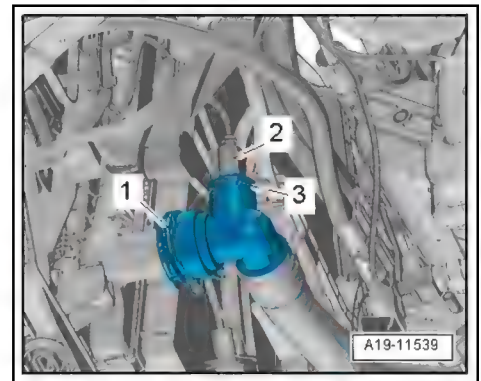
- Wear safety gloves.
- Wear protective eyewear.
- Reduce the pressure by covering the coolant expansion tank cap with a suitable towel and carefully opening it.

- Remove the engine cover. Refer to ⇒ [C3 over", page 106](#) .
- Loosen the outer left and right drive axle bolts. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40; Drive Axle; Drive Axle, Removing and Installing.
- Remove the left and right front wheel. Refer to ⇒ Rep. Gr. 44; Wheel and Tire Guide; Wheel, Changing.
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation.
- Remove the right front wheel housing liner. Refer to ⇒ Body Exterior; Rep. Gr. 66; Wheel Housing Liner; Overview - Front Wheel Housing Liner.



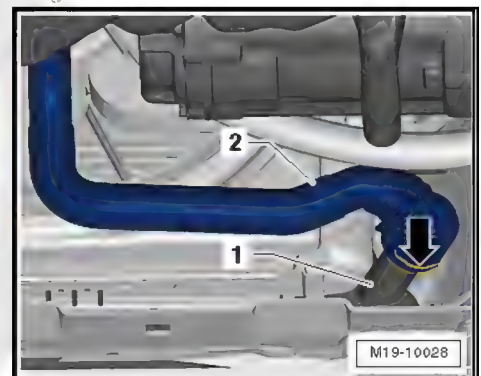


- Disconnect the connector -2- on the Engine Coolant Temperature Sensor on Radiator Outlet -G83-.

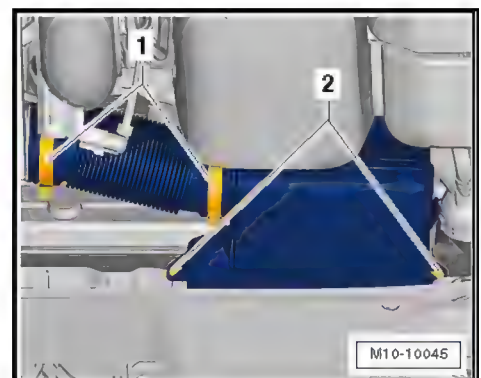


Drained coolant must be stored in a clean container for disposal or reuse.

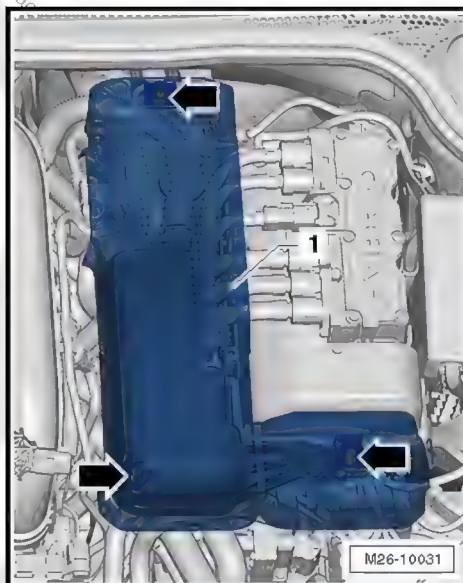
- Place the Shop Crane - Drip Tray -VAS 6208- underneath.
- Lift the clamp -1-, remove the lower left coolant hose from the radiator and drain the coolant.
- Lift the clamp -arrow-, remove the lower right coolant hose -2- from the charge air cooling circuit cooler -1- and drain the coolant.



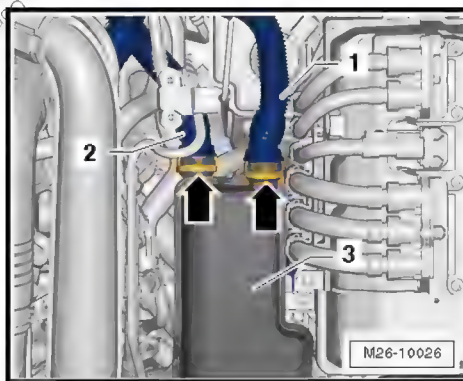
- Loosen the hose clamps -1- and remove the air guide hose.



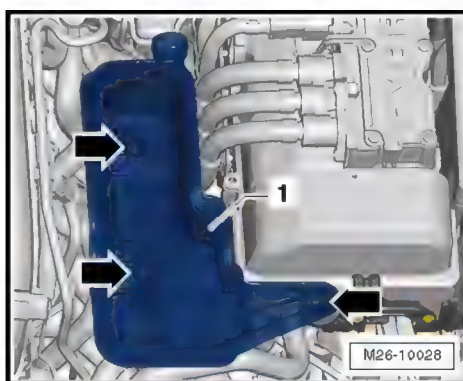
- Remove the bolts -2- on the lock carrier and remove the air guide.
- Unclip and remove the cover -1- upward from the retainers -arrows-.



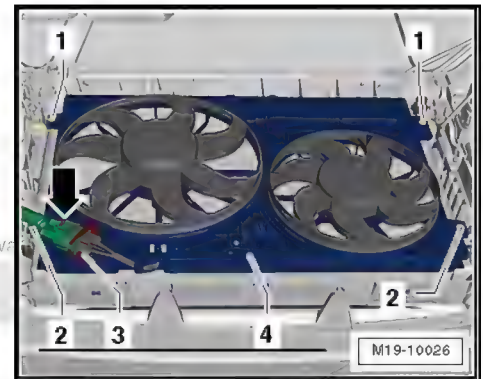
### Vehicles with Secondary Air System



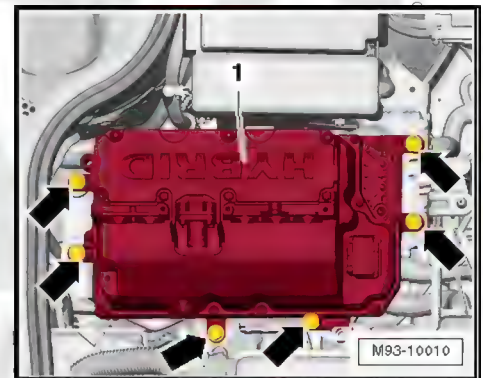
- Squeeze the locking ring -arrows- on both sides and remove the air lines -1 and 2- from the damper -3-.
- Remove the damper -1- upward from the rubber bushings -arrows-.



Continuation for All Vehicles



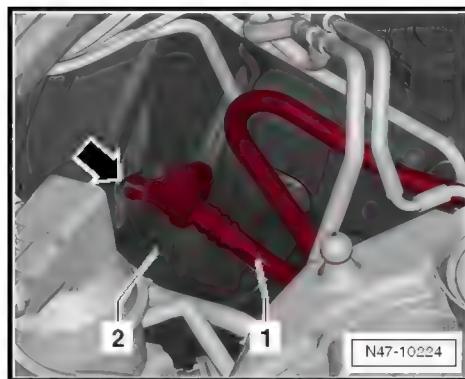
- Remove the fan shroud. Refer to ⇒ [S4.3 hroud, Removing and Installing](#), page 324 .
- Disconnect the 12V battery. Refer to ⇒ Electrical Equipment; Rep. Gr. 27; Battery; Battery, Disconnecting and Connecting.
- Remove the Electric Drive Power and Control Electronics -JX1-. Refer to ⇒ Electrical Equipment; Rep. Gr. 93; Electric Drive Power and Control Electronics; Electric Drive Power and Control Electronics, Removing and Installing.



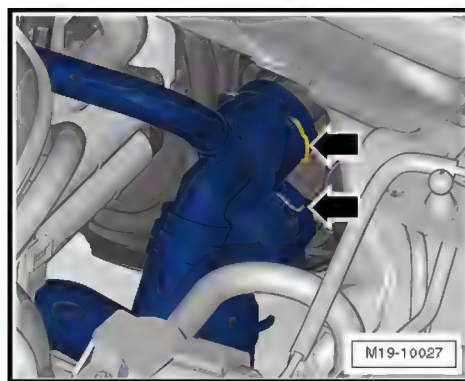
- Remove the Electric Drive Power and Control Electronics -JX1- bracket. Refer to ⇒ Electrical Equipment; Rep. Gr. 93; Electric Drive Power and Control Electronics; Electric Drive Power and Control Electronics, Removing and Installing.



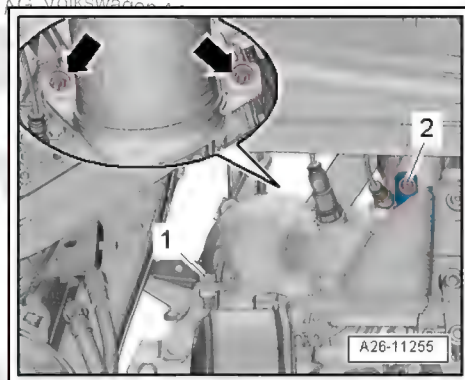
- Remove the vacuum hose -1- from the brake booster -2-.



- Lift the clamps -arrows- and remove the coolant hoses from the heater core.



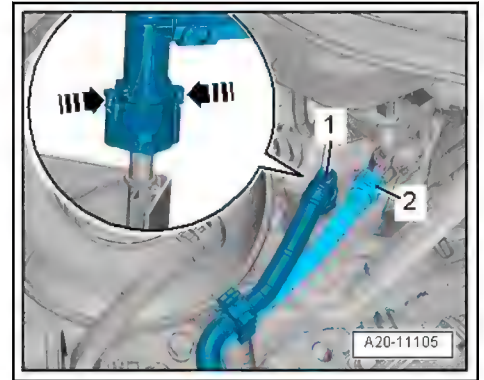
- Remove the front exhaust pipe. Refer to ⇒ [C2.2 onverter, Removing and Installing](#), page 419 .



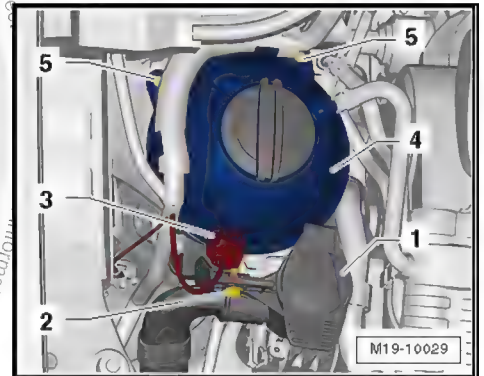
- Disconnect the battery. Refer to ⇒ [Electrical Equipment; Rep. Gr. 27; Battery; Battery, Disconnecting and Connecting](#).
- Unlock and remove the fuel supply line -1-. Disconnect the couplings. Refer to ⇒ [Rep. Gr. 20; Couplings; Couplings, Disconnecting](#).



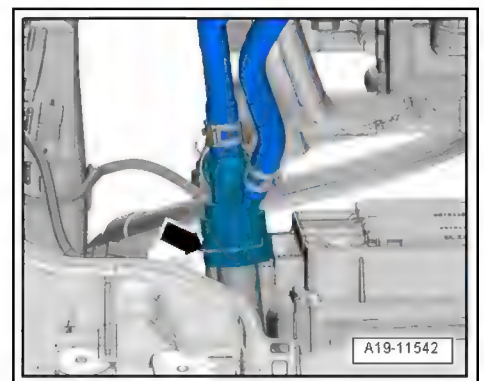




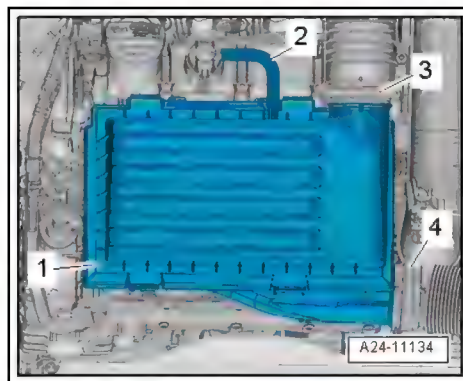
- Release and remove the breather line -2-. Disconnect the couplings. Refer to ➔ Rep. Gr. 20; Couplings; Couplings, Disconnecting.
- Disconnect the connector -3- from the coolant reservoir sensor.



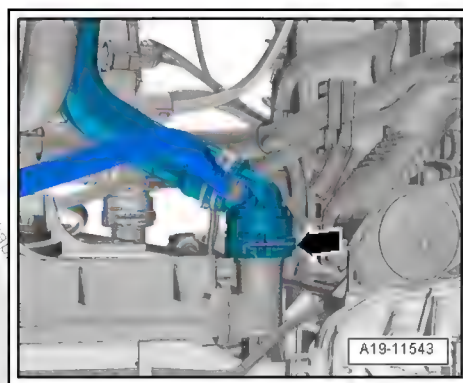
- Remove the bolt -2- and move the windshield washer fluid reservoir filler tube forward -1-.
- Remove the bolts -5- and place the coolant expansion tank -4- on top of the engine with the hoses connected.
- Lift the clamp -arrow- and remove the upper right coolant hose from the charge air cooling circuit cooler.



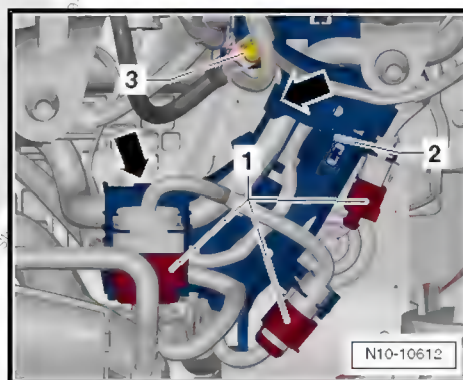
- Remove the air duct hose -2-.



- Pull the air filter housing -1- upward off of the ball pins.
- Loosen the hose clamp -3- and remove the air duct pipe.
- Lift the clamp -arrow- and remove the left upper coolant hose from the radiator.

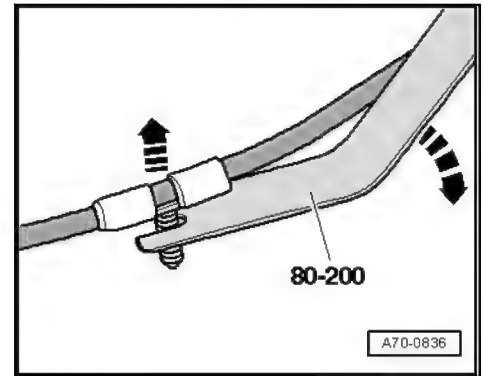


Unclip the connectors -1- from the brackets and open the cable guide -arrows- -2-.

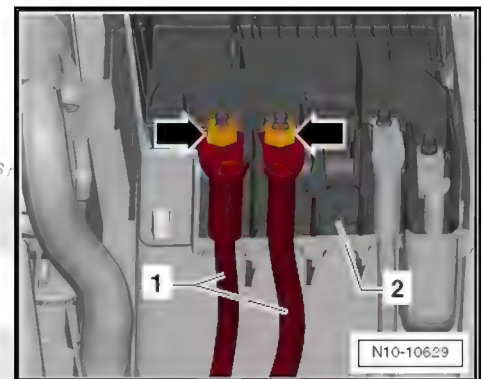


- Release and disconnect the connectors -1-.
- Disconnect the ground connection -3- and free up all wiring harnesses.

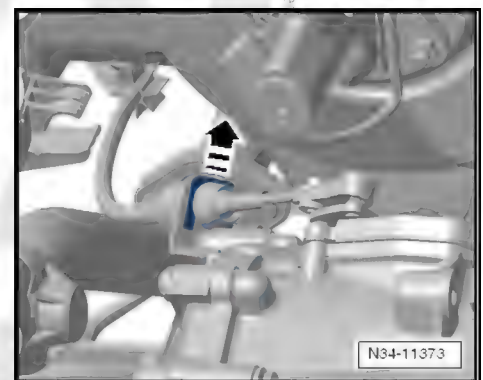
Use the Pry Lever -80 - 200- for removing the spiral clips in the following steps.



- Unlock and disconnect the engine wiring harness connector from the engine control module.
- Loosen the nuts -arrows- to disconnect the battery positive cables -1- from the E-box -2-.



- Disconnect all other connectors between the transmission and the body.
- Free up the wire.
- Remove the selector lever cable and the lock washer from the ball head.



- Remove the cable from the transmission cable bracket very carefully.

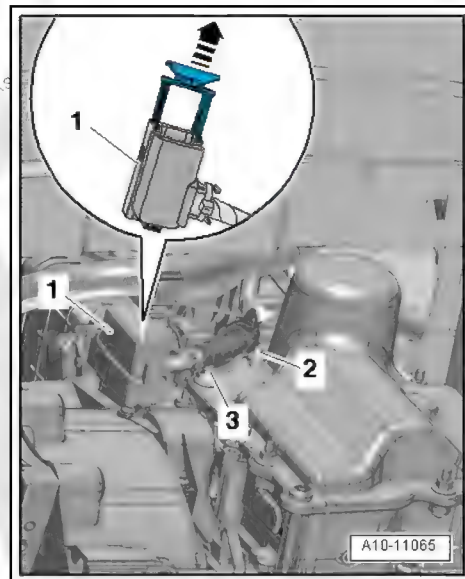


#### Note

*Never touch the connector terminals in the transmission connector. The control module as well as the Mechatronic will get damaged by the static discharge.*

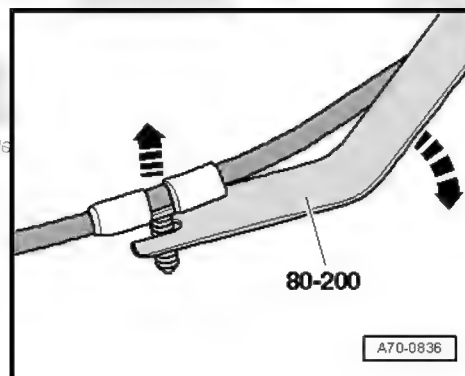


- To discharge static electricity, touch a ground by hand (without gloves).
- Disconnect the connector -1- for the DSG Transmission Mechatronic -J743- by pulling the locking mechanism upward in direction of -arrow-.

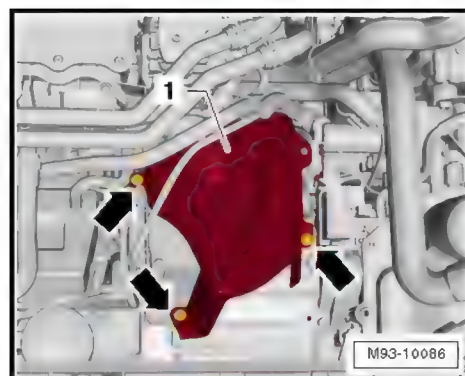


- Disconnect the 12V battery. Refer to ➤ Electrical Equipment; Rep. Gr. 27; Battery; Battery, Disconnecting and Connecting.

Use the Pry Lever -80 - 200- for removing the spiral clips in the following steps.

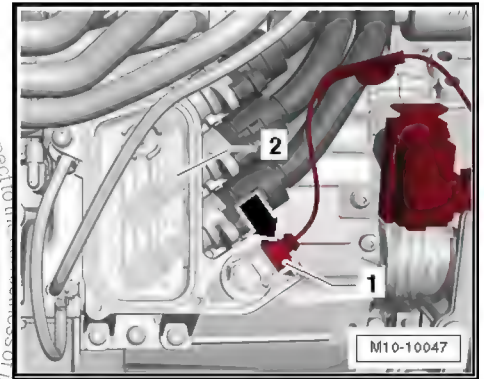


- Remove the clip from the connection box shield.
- Remove the three bolts -arrows- and remove the connection box protective plate for the Electric Drive Motor -V141- -1-.

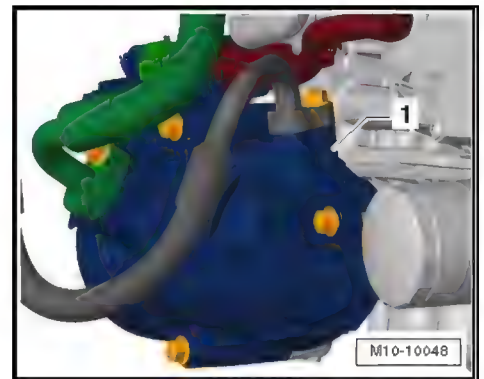




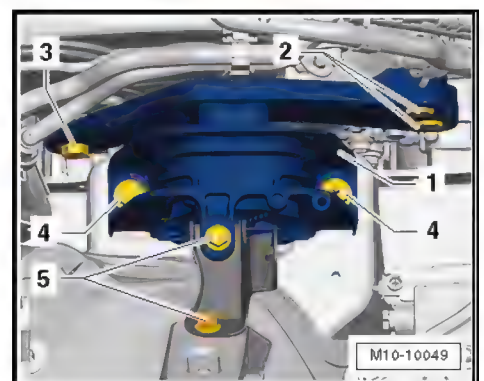
- Open the release -arrow- and disconnect the connector -1- from the contact switch on the connection box -2- for the Electric Drive Motor -V141-.



- Move the wires to the side.
- Remove the Electrical A/C Compressor -V470- from the bracket. Refer to ⇒ Heating, Ventilation and Air Conditioning: Rep. Gr. 87; A/C Compressor; A/C Compressor, Removing and Installing from Bracket.

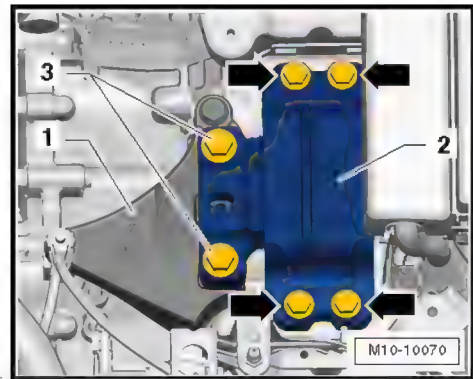
**Note**

- ◆ *There is a risk of damaging the A/C compressor, the refrigerant lines and hoses.*
- ◆ *Do not bend, twist or stretch the refrigerant lines and hoses.*
- Remove the bolts -5- and the bracket.

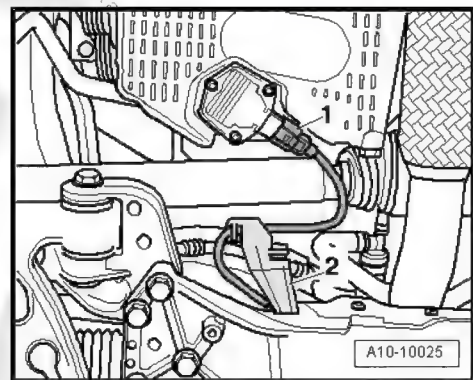


- Remove the bolt -3- about two turns. The bolt is accessible through the right wheel housing.
- Remove the bolts -2 and 4- about two turns.

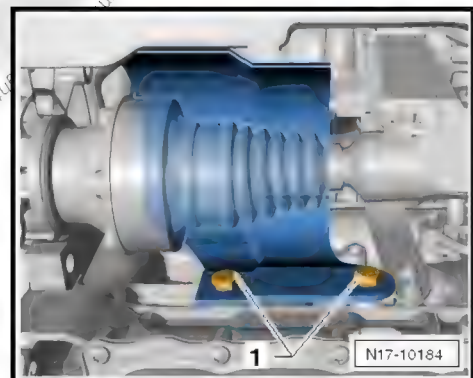
- Remove the bolts -3- from the transmission bracket -1- about two turns.



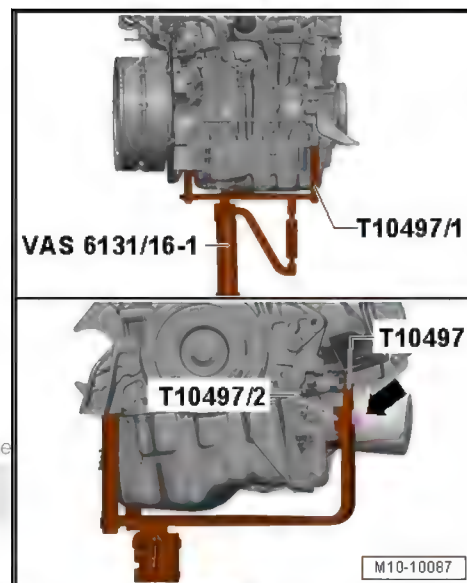
- Disconnect the connector -1- on the Oil Level Thermal Sensor -G266-.



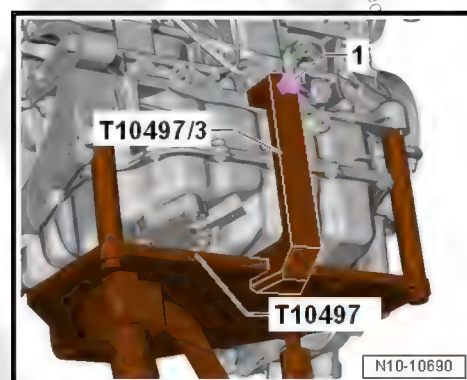
- Remove the subframe with the steering gear. Refer to  
⇒ Suspension, Wheels, Steering; Rep. Gr. 40; Subframe;  
Subframe and Steering Gear, Removing and Installing.
- Loosen the bolts -1- and remove the heat shield from the  
right drive axle.



- Remove the left and right drive axle. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40; Drive Axle; Drive Axle, Removing and Installing.
- Mount the Engine Support - Clamping Piece -T10497/2- on the housing rib of the cylinder block as shown.



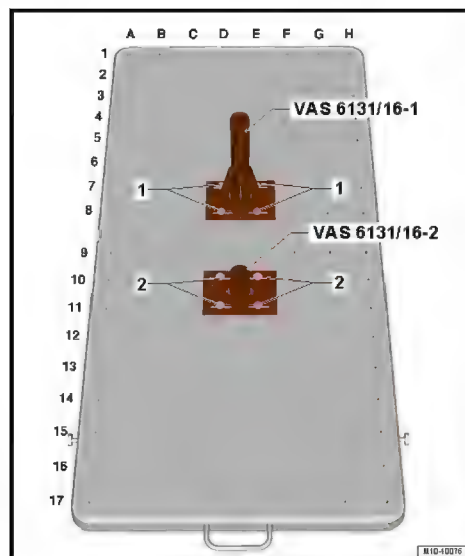
- Position the Engine Support - T10497- on the cylinder block using the pin T10497/1 and then tighten the bolt -arrow- to 20 Nm.
- Attach the Engine Support - Adapter -T10497/3- to the Engine Support -T10497- and tighten the bolt -1- to 20 Nm.



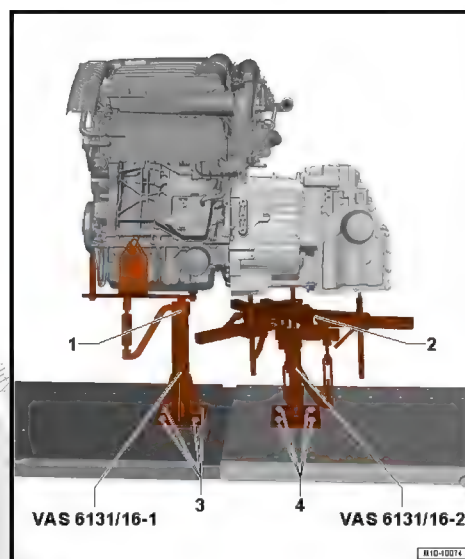
#### Scissor Lift Table -VAS 6131B-, Preparing for Following Procedure

- Position the Scissor Lift Table - Adapter Set - Support 1 -VAS 6131/16-1- on the attachment points D7, E7, D8 and E8, and only tighten the bolts -1- hand-tight.





- Position the Scissor Lift Table - Adapter Set - Support 2 -VAS 6131/16-2- on the attachment points D10, E10, D11 and E11, and only tighten the bolts -2- hand-tight.
- Insert the Transmission Support -3282- -2- into the Scissor Lift Table - Adapter Set - Support 2 -VAS 6131/16-2-.



- Place the Transmission Support - Mounting Plate 43 -3282/66- on the Transmission Support -3282- and align it.
- Position the Scissor Lift Table -VAS 6131B- under the vehicle and raise it.
- Insert the Engine Support -T10497- -1- into the Scissor Lift Table - Adapter Set - Support 1 -VAS 6131/16-1- and slightly lift the engine/transmission assembly.
- Tighten the bolts -3 and 4- to 20 Nm.

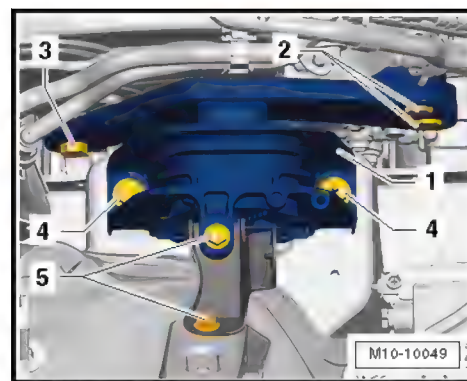


#### Note

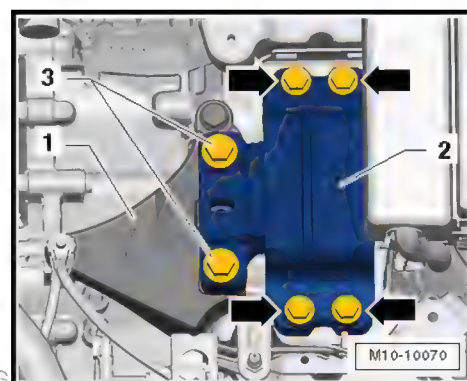
Use a commercially available step ladder to remove the assembly mount bolts.

- Remove the bolts -2 and 3-.





- Remove the engine mount bolts -4- completely and then remove the engine mount -1-.
- Remove the bolts -3- completely from the transmission bracket -1-.



#### Note

- ◆ *Risk of damaging the vacuum lines or wires as well as the engine compartment.*
- ◆ *Make sure all the vacuum lines or wires between the engine, the transmission, the subframe and the body are loosened.*
- Slightly lower the engine/transmission assembly.
- Move the engine/transmission assembly using the Scissor Lift Table -VAS 6131B- and then lower it farther.

## 1.2 Engine and Transmission, Separating

### Special tools and workshop equipment required

- ◆ Bits for V.A.G. 1331/13 -T10099-





- ◆ Socket - Xzn 14 -T10061-



- ◆ Engine/Gearbox Support Shackle (2 pc.) -10 - 222 A /12-



- ◆ Shop Crane -VAS 6100-

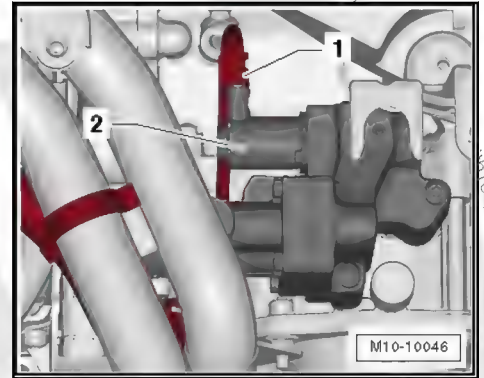


#### Note

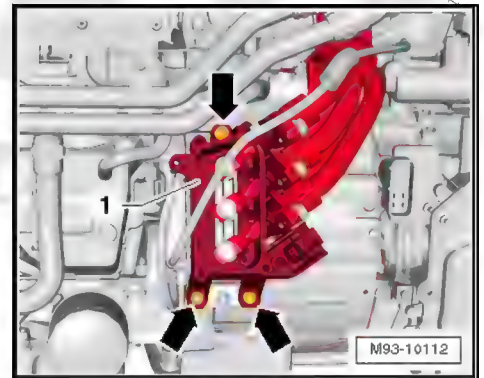
- ◆ *Danger of damaging the components.*
- ◆ *Pull the transmission off the engine using the Centering Mandrel -T10515-.*

#### Procedure

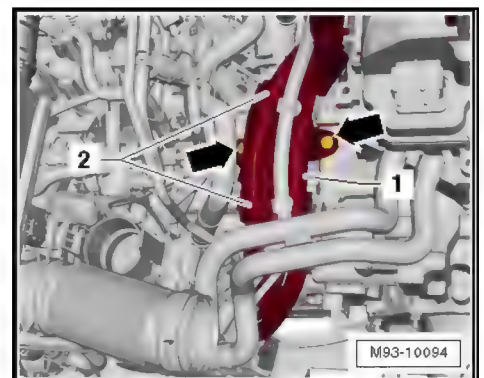
- Engine/transmission assembly removed and mounted on the Scissor Lift Table -VAS 6131B-.
- Disconnect the connector -1- from the Mechatronic switch valve -2- and remove the wiring harness from the front bracket on the transmission.



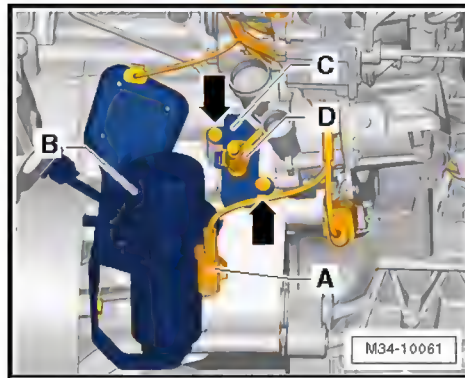
- Remove the Drive Motor High-Voltage Wiring Harness -PX2- together with the connection box -1- from the transmission. Refer to ⇒ Electrical Equipment; Rep. Gr. 93; High-Voltage Cables; Drive Motor High-Voltage Wiring Harness, Removing and Installing.



- While doing so, also remove the wiring bracket -1- for the Drive Motor High-Voltage Wiring Harness -PX2- from the transmission -arrows-. Refer to ⇒ Electrical Equipment; Rep. Gr. 93; High-Voltage Cables; Drive Motor High-Voltage Wiring Harness, Removing and Installing.



- Release and disconnect the connector -A- from the Brake System Vacuum Pump - V192- -B-.

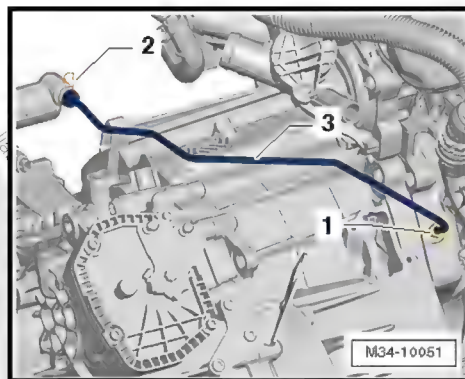


- Remove the bracket with the Brake System Vacuum Pump -V192- -B- from the transmission and tie up on the side of the engine.
- Release and disconnect the connector -D- from the Drive Motor Rotor Position Sensor 1 -G713- -C-.
- Remove the bolts -arrows- and remove the Drive Motor Rotor Position Sensor 1 -G713-.



#### Note

- ◆ *Danger of contamination.*
  - ◆ *Thoroughly clean the connection points and the surrounding area before loosening.*
  - ◆ *The Mechatronic hydraulic system is now open. Dirt can cause the system to malfunction.*
- Remove the nut -1- for the hydraulic pipe -3- from the engine.



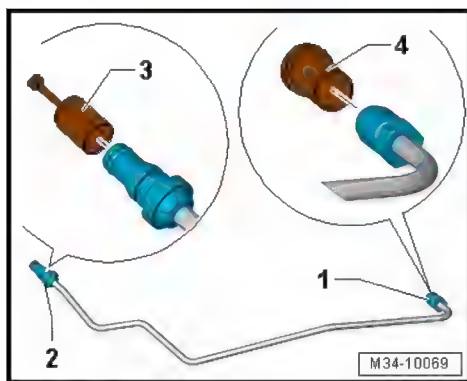
Remove the clamps -2- from the valve block/Mechatronic.

Pull the hydraulic line -3- at the same time out of the engine and valve block.

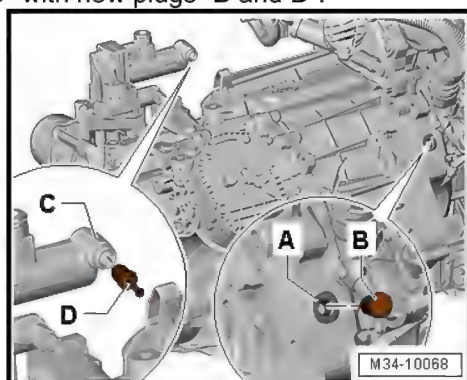
- Immediately seal off the hydraulic line connections -1 and 2- with the new plugs -3 and 4-. The hydraulic fluid should remain in the line if possible, otherwise it should not become dirty.



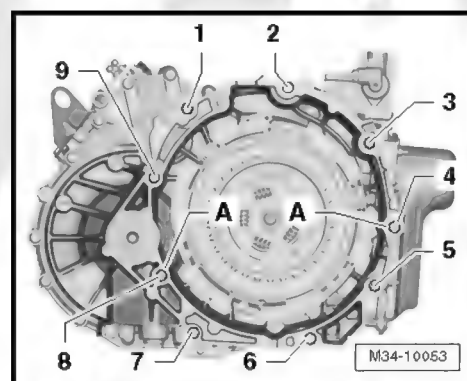




- Also seal off the connections on the engine -A- and valve block/Mechatronic -C- with new plugs -B and D-.

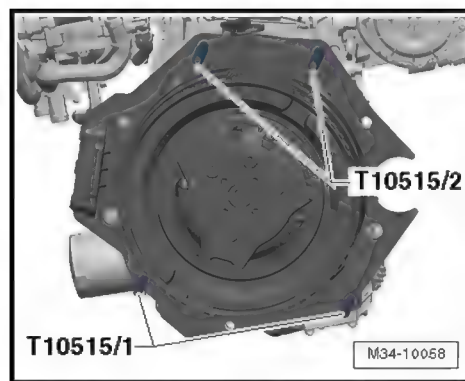


- Always use new plugs. Refer to the → Electronic Parts Catalog (ETKA). The sealing plugs cannot be used again.
- Remove the transmission/engine bolts -1 through 7-.



#### Note

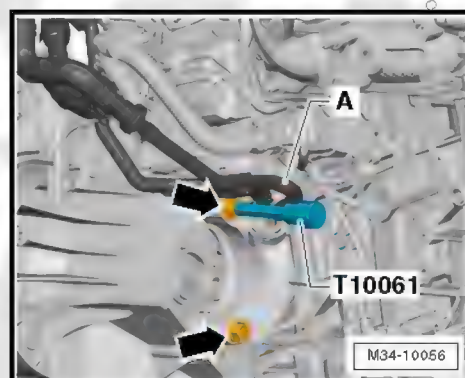
- ◆ The bolts -3 and 4- can be loosened using the Bit - T10099/1-.
- ◆ Bolts -8 and 9- remain installed.
- Insert the Centering Mandrels -T10515- into the engine as shown.



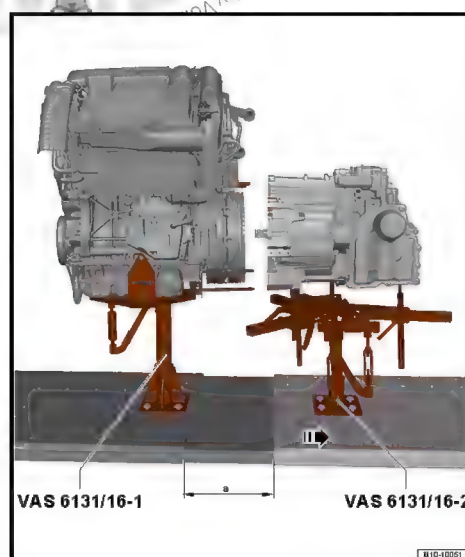
#### Note

To improve clarity, the transmission is not shown in the illustration.

- Remove the engine/transmission connecting bolts -arrows- from the engine side, for example using the Socket - Xzn 14 -T10061-. Pay attention to the coolant line -A- at the same time.



- Push the transmission off the alignment sleeves on the engine.
- Loosen the rolling platform locking mechanism from the Scissor Lift Table -VAS 6131B- on the left and right sides.





- Carefully remove the transmission in the direction of -arrow- from the engine, while being careful not to damage the connections on the Electric Drive Motor -V141- and the Drive Motor Temperature Sensor -G712-.
- Remove the transmission from the engine the maximum distance -a- and secure the rolling platform to prevent it from moving.

### 1.3 Electric Drive Motor -V141-, Separating from Engine

Special tools and workshop equipment required

- ◆ Used Oil Collection and Extraction Unit -SMN372500-



- ◆ Engine Bung Set -VAS 6122-



- ◆ Shop Crane - Drip Tray -VAS 6208-





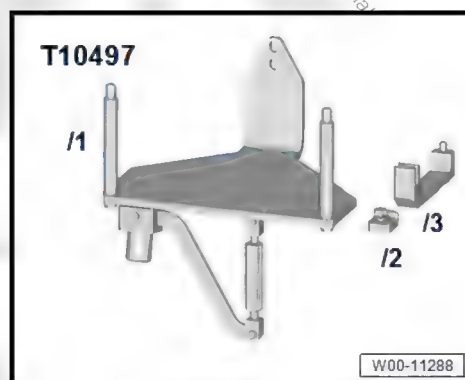
◆ Scissor Lift Table -VAS 6131 B-



◆ Hose Clip Pliers -VAS 6362-



◆ Engine Support -T10497-



◆ Hose Clamps - Up To 25 mm -3094-







- ◆ Counter Support -VAS 251 621-



- ◆ Internal Puller -VAS 251 635-



- ◆ Internal Puller -VAS 251 605-



- ◆ Commercially available Step Ladder



- ◆ Scissor Lift Table - Adapter Set - Articulated Joint Support -VAS 6131/16-3-
- ◆ Socket - Xzn 8 -T40159-
- ◆ Protective Eyewear
- ◆ Safety Gloves

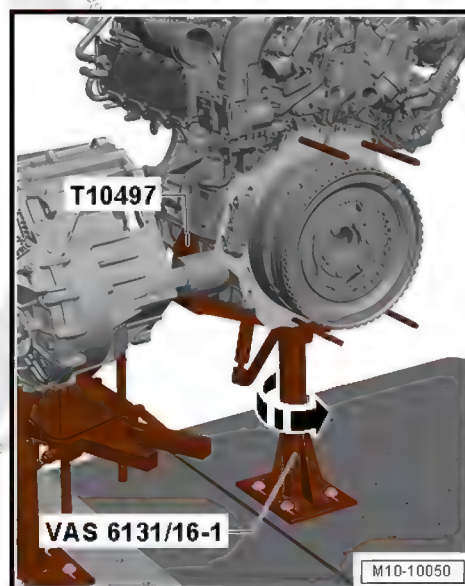


## Note

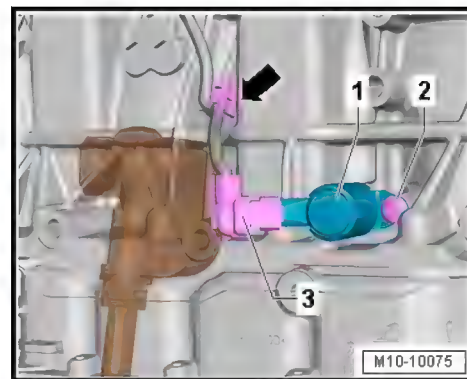
- ◆ *Danger of damaging the components.*
- ◆ *The center bolt behind the needle bearing has a left-hand thread.*
- ◆ *When removing the Electric Drive Motor -V141-, the engine must be secured with the Scissor Lift Table - Q7 Set - Articulated Joint Support -VAS 6131/13-7- on the Scissor Lift Table -VAS 6131B-.*
- ◆ *When loosening the central bolt, counterhold it using the Counterhold - Electric Drive -T10516- and a suitable lever (3/4 inch, square).*
- ◆ *Only remove the Electric Drive Motor -V141- from the engine using the Centering Mandrels -T10515-.*

## Procedure

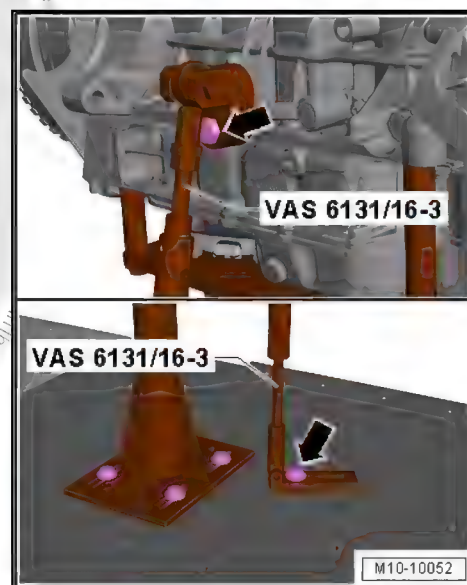
- The transmission is separated from the engine. Refer to ➤ [a1.2 nd Transmission, Separating", page 23](#) .
- Using the Engine Support -T10497-, turn the engine 90° in the direction of -arrow- counter-clockwise in the Scissor Lift Table - Adapter Set - Support 1 -VAS 6131/16-1-.



- Remove the connector -3- from the regulator valve -1- to prevent it from becoming damaged when installing the Scissor Lift Table - Adapter Set - Articulated Joint Support -VAS 6131/16-3-.



- Unclip the wire with the bracket -arrow- and set them aside.
- Secure the Scissor Lift Table - Adapter Set - Articulated Joint Support -VAS 6131/16-3- on the engine and tighten the bolt -top arrow-.

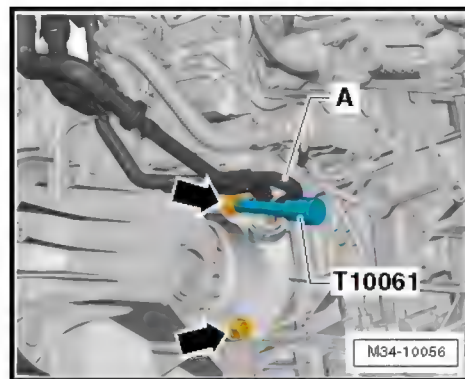


- Fasten the bottom of the Scissor Lift Table - Adapter Set - Articulated Joint Support -VAS 6131/16-3- to the Scissor Lift Table -VAS 6131B-.

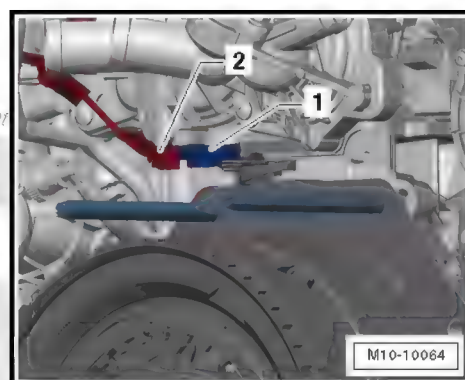
#### Tightening Specifications

Component	Tightening Specification
Bolts -top arrow-	20 Nm
Bolts -lower arrow-	20 Nm

- Clamp off both the coolant lines -A- using the Hose Clamps - Up To 25mm -3094-.



- Disconnect the connector -1- from the Drive Motor Temperature Sensor -G712- -2-.

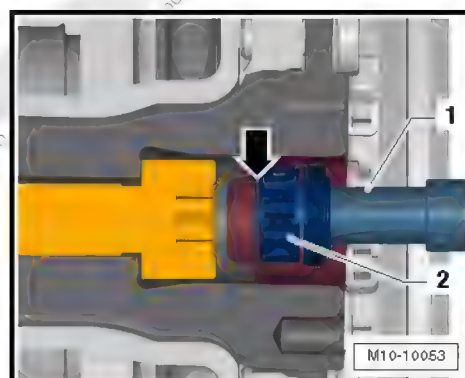


- Remove the needle bearing as follows.



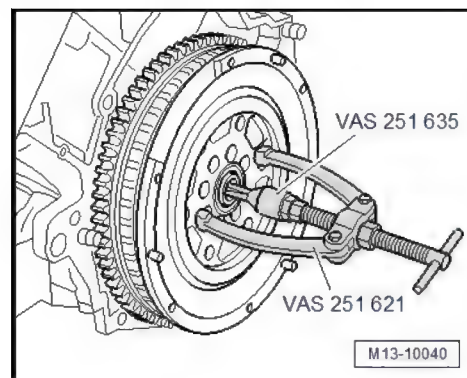
**Note**

- ◆ The front edges of the internal puller must not be broken off.
- ◆ Always replace the needle bearing after removing it.
- Mount the Internal Puller -VAS 251 635- or -VAS 251 605- -1- directly behind the needles -arrow- on the needle bearing -2- and pretension the internal puller by tightening the nut by hand.



- Install the Internal Puller -VAS 251 635- or -VAS 251 605- and the Counter Support -VAS 251 621- as shown.





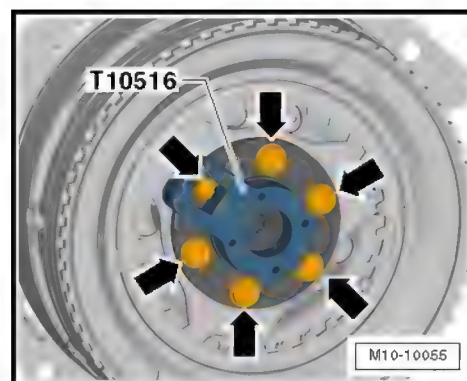
- Turn the nut on the Counter Puller -VAS 251 621- and remove the needle bearing.



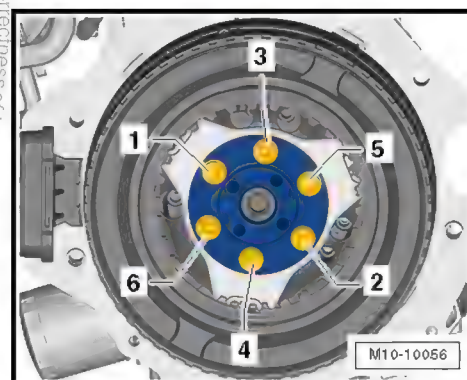
### Note

*A second technician will be needed for the following procedure.*

- Insert the Counterhold - Electric Drive -T10516- into the crankshaft flange using a suitable extension and counterhold it when loosening the bolts -arrows-.



- Remove the bolts -1 through 6-. While doing so, move the Counterhold - Electric Drive -T10516- to reach all the bolts.



### Note

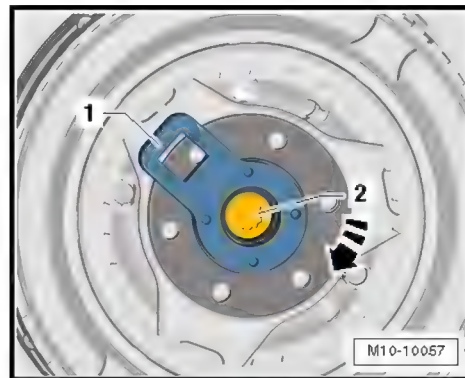
*A second technician will be needed for the following procedure.*

### Risk of Damaging Components

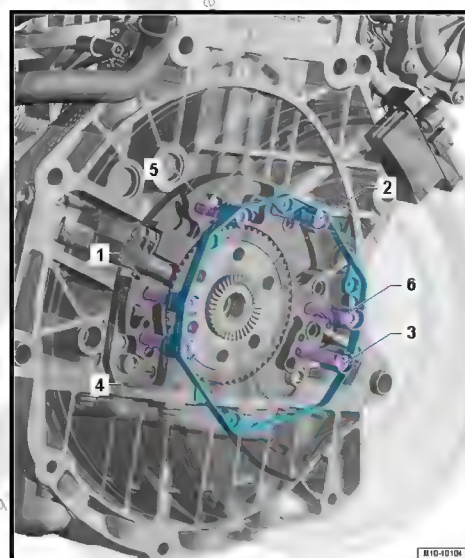
- ◆ The central bolt -2- has a left-hand thread.



- ◆ The correct tools must be used to loosen the central bolt -2- due to the high torque.
- Insert the Counterhold - Electric Drive -T10516- into the crankshaft flange using a suitable extension and counterhold it when loosening the bolt.



- When loosening the bolt -2- in the direction of -arrow-, counterhold it using the Counterhold - Electric Drive -T10516- -1- so that the drivetrain does not get pulled out of the engine bracket.
- Remove the crankshaft flange with the shim.
- Make sure that the upper Centering Mandrel -T10515/2- and lower Centering Mandrel -T10515/1- are installed.
- The Electric Drive Motor -V141- is attached to the engine with the bolts -1 through 6-.



- Only the bolts -1 through 3- are accessible. After turning the Electric Drive Motor -V141-, the bolts -4 through -6- are accessible.



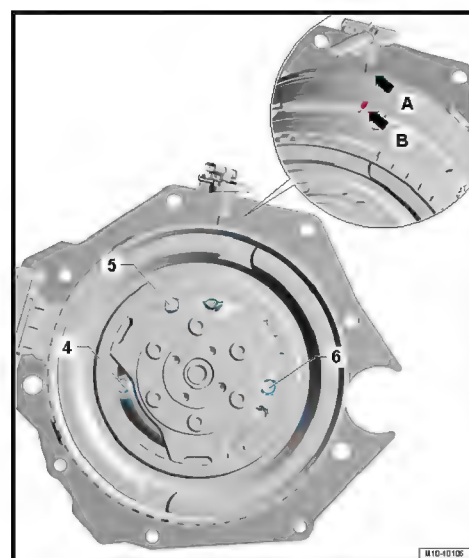
## Step 1 for Loosening the Connecting Bolts of the Electric Drive Motor -V141- on the Sealing Flange



### Note

- ◆ -Arrow A- points to the wire for the Drive Motor Temperature Sensor -G712-
- ◆ -Arrow B- indicates the marking (notch) that is located on the Electric Drive Motor -V141-.
- The bolts -1 through 3- are only accessible in this position -arrow A- and -arrow B-.
- Remove the bolts -1 to 3- from the engine using the Socket -Xzn 8 -T40159-, but leave them in the Electric Drive Motor -V141-.

## Step 2 for Loosening the Connecting Bolts of the Electric Drive Motor -V141- on the Sealing Flange





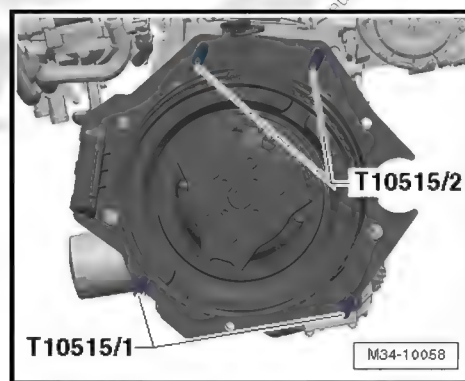
#### Note

- ◆ -Arrow A- points to the wire for the Drive Motor Temperature Sensor -G712-
- ◆ -Arrow B- indicates the marking (notch) that is located on the Electric Drive Motor -V141-.
- Turn the Electric Drive Motor -V141- so that both markings -arrow A- and -arrow B- line up as illustrated.
- Remove the bolts -4 to 6- from the engine using the Socket -Xzn 8 -T40159-, but leave them in the Electric Drive Motor -V141-.



#### Note

- ◆ *Danger of damaging the components.*
- ◆ *The Electric Drive Motor -V141- is permanently connected to the intermediate plate which must not be damaged.*
- ◆ *Together with the intermediate plate, the Electric Drive Motor -V141- is pulled out and removed from the engine.*
- ◆ *Both technicians are only allowed to touch the unit on the Electric Drive Motor -V141- and not on the intermediate plate.*
- Install the Centering Mandrel -T10515- (if missing) into the engine, as illustrated.

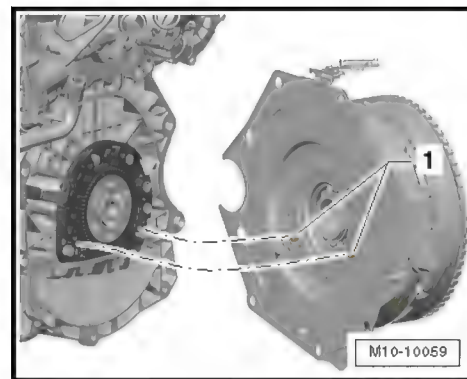


#### Note

*A second technician will be needed for the following procedure.*

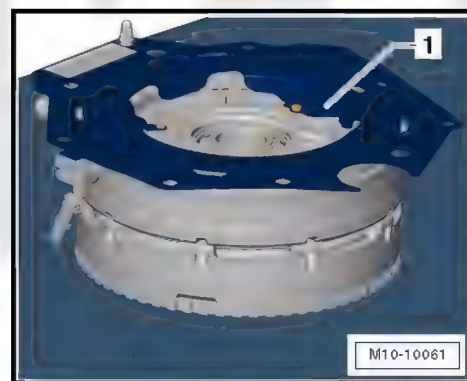
- Both technicians pull the Electric Drive Motor -V141- forward out of the centering mounts without tilting the unit on the guide.





### Note

- ◆ *Danger of damaging the components.*
- ◆ *Place the Electric Drive Motor -V141- with the intermediate plate on a clean surface facing up.*
- ◆ *Close all engine openings on the Electric Drive Motor -V141- and the engine with plugs. Refer to the ⇒ Electronic Parts Catalog (ETKA).*
- ◆ *Use only new plugs to seal. Refer to the ⇒ Electronic Parts Catalog (ETKA).*
- ◆ *The sealing plugs cannot be used again.*
- Place the Electric Drive Motor -V141- with the intermediate plate on a clean surface facing up.



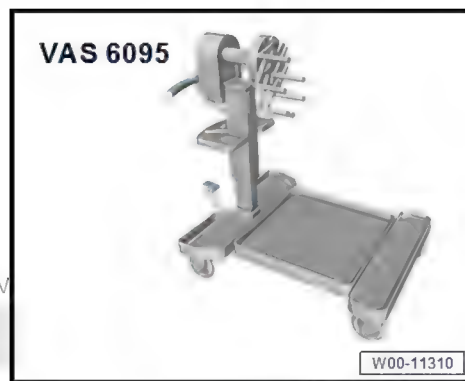
- Immediately seal all openings with sealing plugs from the sealing plug set for the Electric Drive Motor -V141-. Refer to the ⇒ Electronic Parts Catalog (ETKA).

## 1.4 Engine, Securing to Engine and Transmission Holder

Special tools and workshop equipment required



♦ Engine and Transmission Holder -VAS 6095A-

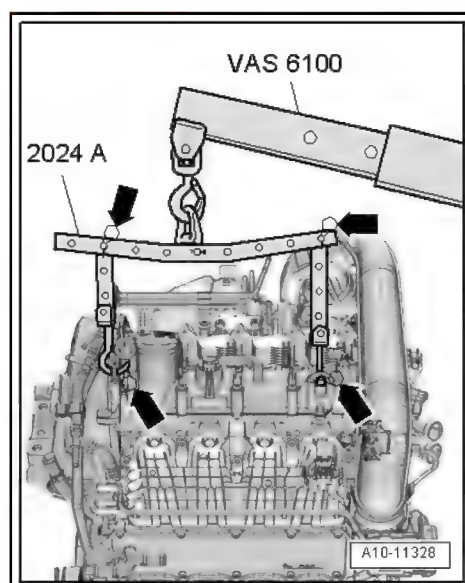


♦ Shop Crane -VAS 6100-



Procedure

- The transmission is separated from the engine. Refer to [a1.2 nd Transmission, Separating](#), page 23 .
- Electric Drive Motor -V141-, separating from engine. Refer to [⇒ D1.3 rive MotorV141, Separating from Engine](#), page 29 .
- Centering Mandrel -T10515/1- and Centering Mandrel -T10515/2-, removing from the engine.
- Remove the resonator for the intake air scoop. Refer to [⇒ A2.3 ir Scoop Resonator, Removing and Installing](#), page 371 .
- Engage the Engine Sling -2024A- on engine and on Shop Crane -VAS 6100- as shown.





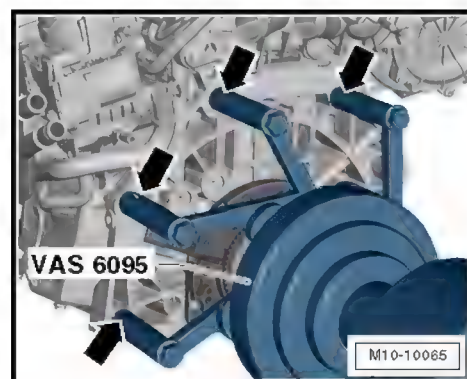
## Note

*The rail with holes must be inserted as shown to align it to the center of gravity of the assembly.*



## Note

- ◆ Risk of accident due to loose engine support bridge components.
- ◆ Lifting hooks and pins on the engine sling must be secured with securing pins -arrows-.
- Lower the engine from the Engine Support T10497 using the Shop Crane -VAS 6100-.
- Secure the engine to the Engine and Transmission Holder -VAS 6095- as illustrated.



## 1.5 Electric Drive Motor -V141-, Attaching to Engine

⇒ [E1.5.1 Electric Drive Motor V141, Attaching to Engine, New Electric Drive Motor V141", page 41](#)

⇒ [E1.5.2 Electric Drive Motor V141, Attaching to Engine, Reinstalling Electric Drive Motor V141", page 54](#)

### 1.5.1 Electric Drive Motor -V141-, Attaching to Engine, New Electric Drive Motor -V141-

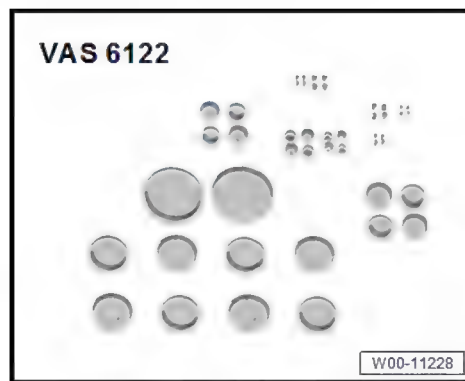
Special tools and workshop equipment required

- ◆ Used Oil Collection and Extraction Unit -SMN372500-





◆ Engine Bung Set -VAS 6122-



◆ Shop Crane - Drip Tray -VAS 6208-



◆ Scissor Lift Table -VAS 6131 B-



◆ Hose Clip Pliers -VAS 6362-







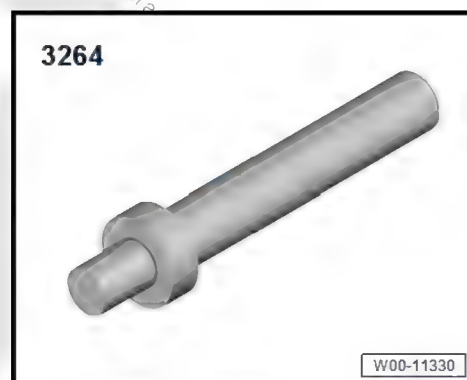
◆ Counter Support -VAS 251 621-



◆ Internal Puller - VAS 251 603-



◆ Bearing Installer - Crankshaft Pilot Bearing -3264-



◆ Centering Mandrel -T10515-





- ◆ Commercially available Step Ladder

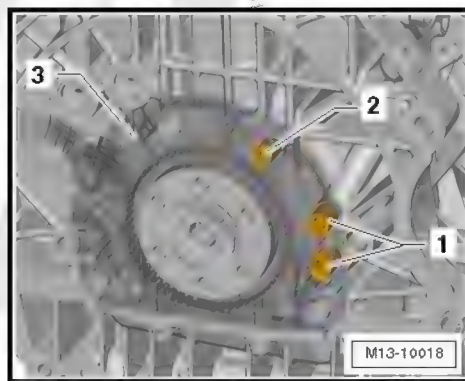


- ◆ Protective Eyewear
- ◆ Safety Gloves



#### Note

- ◆ *Danger of damaging the components.*
- ◆ *When installing the Electric Drive Motor -V141-, the engine must be secured with the Scissor Lift Table - Q7 Set - Articulated Joint Support -VAS 6131/13-7- on the Scissor Lift Table -VAS 6131B-.*
- ◆ *Counterhold the central bolt with the Counterhold - Electric Drive -T10516- and a suitable lever when securing.*
- ◆ *Attach the Electric Drive Motor -V141- to the engine only with the Centering Mandrels -T10515- installed.*
- Remove all of the plugs and protective film from the Electric Drive Motor -V141- and engine.
- Remove the sealing bushings -1 and 2- from the sealing flange -3-.

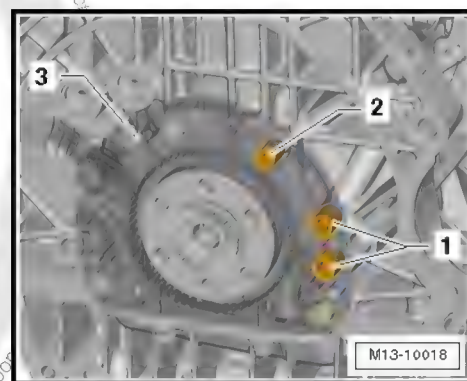


- If it is difficult to move the Internal Puller -VAS 251 603- and Counter Support -VAS 251 621-, remove the sealing bushings.



## Note

- ◆ *The sealing bushings are longer than the sealing flange.*
- ◆ *The sealing bushings are supported against both surfaces and seal off the openings when bolting the Electric Drive Motor -V141- to the engine.*
- ◆ *Replace the sealing bushings after each time the Electric Drive Motor -V141- is removed. Refer to the ⇒ Electronic Parts Catalog (ETKA).*
- ◆ *There are different sealing bushings.*
- ◆ *They have different diameters.*
- *Install the new sealing bushings for the coolant pass-through 1- and for the decoupler -2-. Refer to the ⇒ Electronic Parts Catalog (ETKA).*



## Note

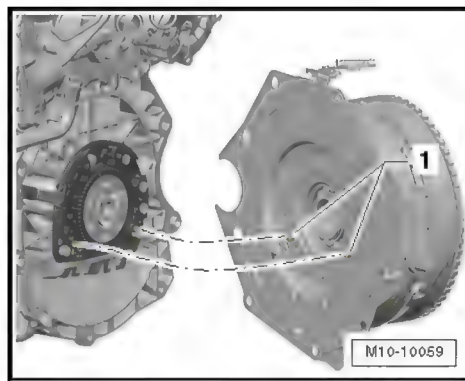
- ◆ *Danger of damaging the components.*
- ◆ *Both technicians may only hold the unit at the Electric Drive Motor -V141-. Not on the intermediate plate.*
- ◆ *The Electric Drive Motor -V141- is permanently connected to the intermediate plate which must not be damaged.*
- ◆ *The Electric Drive Motor -V141- is attached and bolted to the engine with the intermediate plate.*



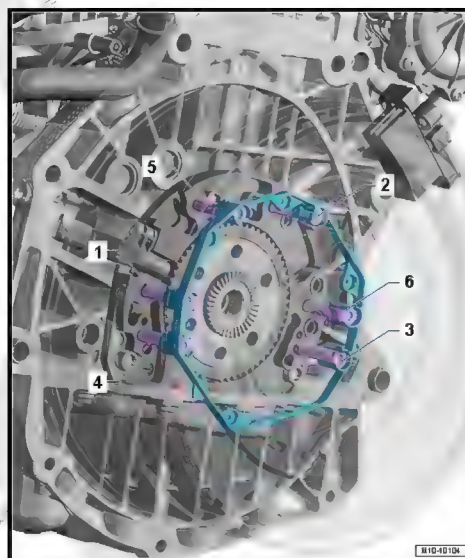
## Note

*A second technician will be needed for the following procedure.*

- Both technicians mount the Electric Drive Motor -V141- on the engine without tilting it on the guide.
- Install the Electric Drive Motor -V141- with the centering mounts -1-.



- Attach the Electric Drive Motor -V141- with the bolts -1 to 6- to the engine using the Socket - Xzn 8 -T40159-.



- Only the bolts -1 through 3- are accessible. After turning the Electric Drive Motor -V141-, are the bolts -4 through 6- accessible.

#### Bolt Position 1



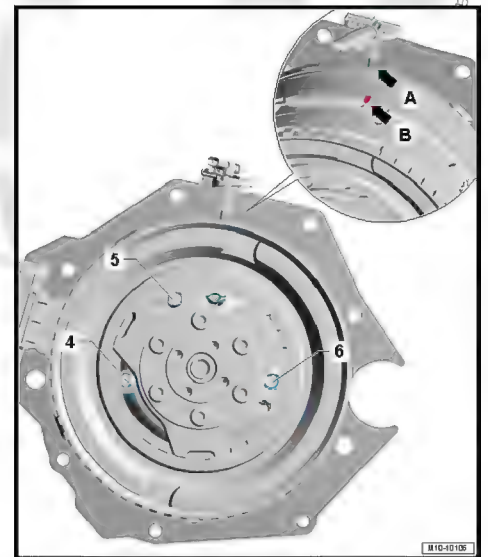




#### Note

- ◆ -Arrow A- points to the wire for the Drive Motor Temperature Sensor -G712-
- ◆ -Arrow B- indicates the marking (notch) that is located on the Electric Drive Motor -V141-.
- A pin -arrow- secures the new Electric Drive Motor -V141- from turning.
- The bolts -1 through 3- are only accessible in this position -arrow A- and -arrow B-.
- Hand tighten the bolts -1 through 3- all the way.
- Remove the pin -arrow-.

#### Bolt Position 2



#### Note

- ◆ -Arrow A- points to the wire for the Drive Motor Temperature Sensor -G712-
- ◆ -Arrow B- indicates the marking (notch) that is located on the Electric Drive Motor -V141-.
- Turn the Electric Drive Motor -V141- so that both markings -arrow A- and -arrow B- line up as illustrated.
- The bolts -4 through 6- can now be reached.
- Tighten the bolts -4 through 6- all the way hand-tight.

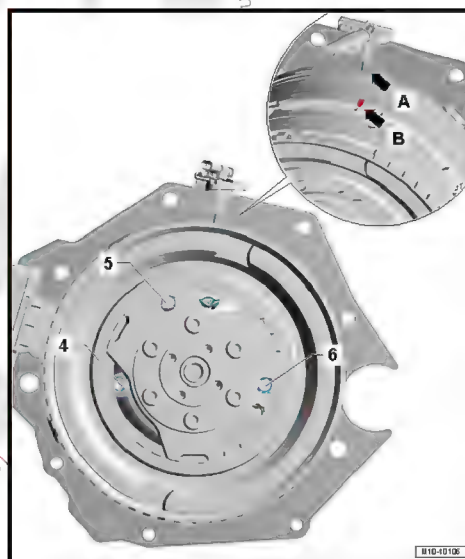


### Bolt Position 1



- Turn the Electric Drive Motor -V141- so that both markings -arrow A- and -arrow B- line up as illustrated.
- Tighten the bolt -1 through 3- to the tightening specification. Refer to ➤ [-2.1 Cylinder Block, Transmission Side](#), page [119](#).

### Bolt Position 2



- Turn the Electric Drive Motor -V141- so that both markings -arrow A- and -arrow B- line up as illustrated.
- Tighten the bolts -4 through 6- to the tightening specification. Refer to ➤ [-2.1 Cylinder Block, Transmission Side](#), page [119](#).

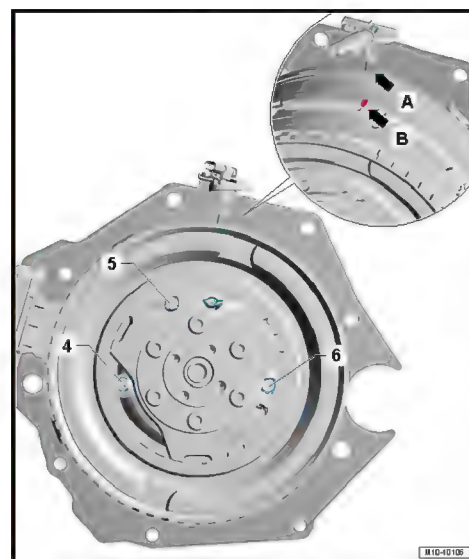


## Bolt Position 1



- Turn the Electric Drive Motor -V141- so that both markings -arrow A- and -arrow B- line up as illustrated.
- Tighten the bolt -1 through 3- to the tightening angle. Refer to [⇒ -2.1 Cylinder Block, Transmission Side, page 119](#).

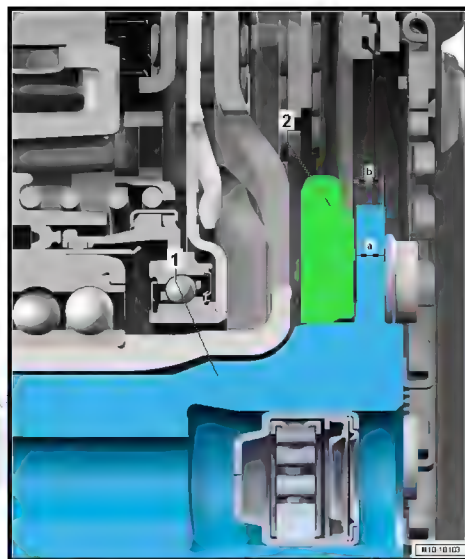
## Bolt Position 2



- Turn the Electric Drive Motor -V141- so that both markings -arrow A- and -arrow B- line up as illustrated.
- Tighten the bolts -4 through 6- with an additional turn. Refer to [⇒ -2.1 Cylinder Block, Transmission Side, page 119](#).



## Selecting the Correct Shim



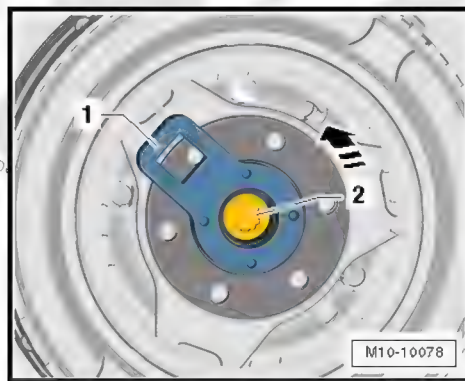
### Note

*There is a shim installed between the crankshaft flange -1- and the Electric Drive Motor -V141- -2- which must be redetermined when the Electric Drive Motor -V141- is replaced.*



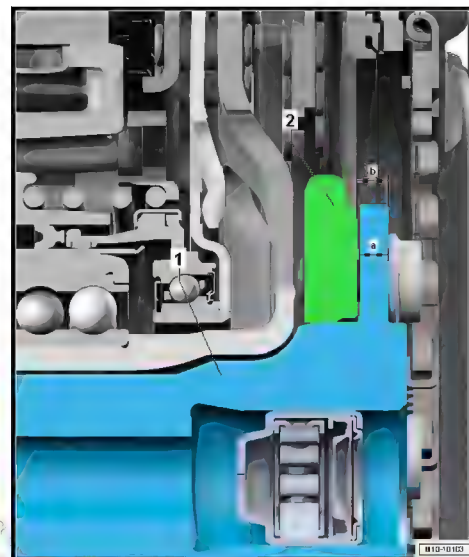
### Note

- ◆ *Danger of damaging the components.*
- ◆ *The central bolt -2- has a left-hand thread.*
- Position the hub on the crankshaft without shim and tighten the central bolt to 60 Nm.



- Insert the Counterhold - Electric Drive -T10516- -1- into the hub with a suitable extension and counterhold it when tightening the central bolt -2-.
- Perform three measurements, 120° offset, through the flange holes and determine the depth dimension from the outside edge of the flange -1- to the surface of the Electric Drive Motor -V141- -2-.





- The gap dimension is calculated from the depth dimension of the hub shim minus the average value of the three measurements.

Gap dimension d = dimension b - dimension a

- Use the calculated gap dimension to select a shim with the correct thickness. Refer to the ➔ Electronic Parts Catalog (ETKA).

Gap Dimension d (mm)	Shim Thickness (mm)
0.26 - 0.45	0.8
0.46 - 0.65	1
0.66 - 0.85	1.2
0.86 - 1.05	1.4
1.06 - 1.25	1.6
1.26 - 1.45	1.8
1.46 - 1.65	2
1.66 - 1.85	2.2
1.86 - 2.05	2.4
2.06 - 2.25	2.6

- Loosen the central bolt again and remove the flange. Install the flange again with the shim.
- Make sure the teeth on the hub and the teeth on the crankshaft fit correctly. To do this, turn the hub with a light preload until it latches and a torque is felt.



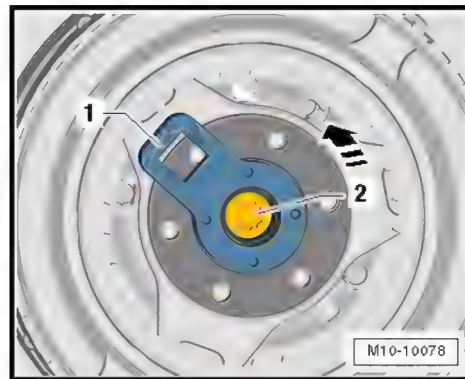
#### Note

*A second technician will be needed for the following procedure.*

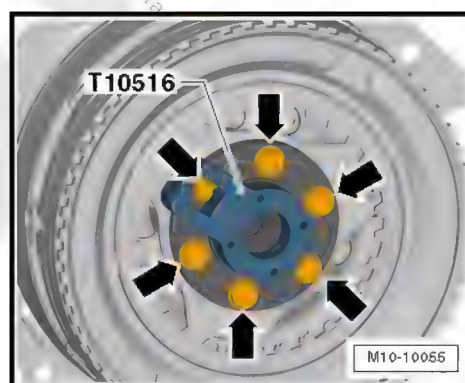


## Note

- ◆ *Danger of damaging the components.*
- ◆ *The central bolt -2- has a left-hand thread.*
- ◆ *The correct tools must be used to tighten the central bolt -1- due to the high torque needed.*
- Insert the Counterhold - Electric Drive -T10516- -1- into the hub with a suitable extension and counterhold it when tightening the central bolt -2-.



- Do not pull the drive train out of the engine/transmission support while tightening.
- Tighten the new central bolt. Refer to [⇒ -2.1 Cylinder Block, Transmission Side](#), page 119 .
- Turn the rotor on the Electric Drive Motor -V141- to line up the holes in the clutch plate, the shim and the hub flange.
- Install the bolts -arrows-.
- Insert the Counterhold - Electric Drive -T10516- into the crankshaft flange using a suitable extension and counterhold while tightening the bolts. At the same time, move the Counterhold - Electric Drive -T10516- to reach all the bolts.



## Note the Tightening Sequence

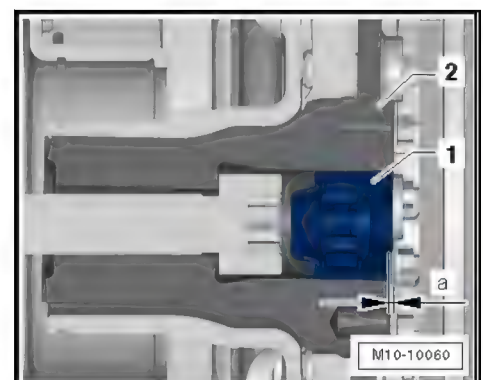
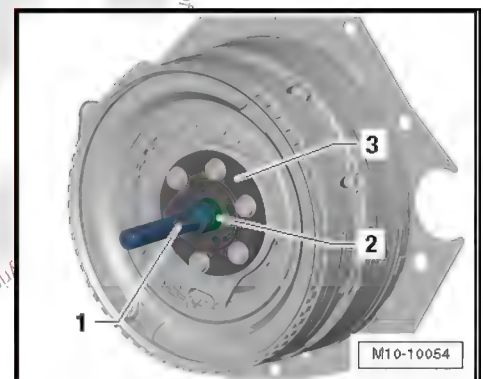
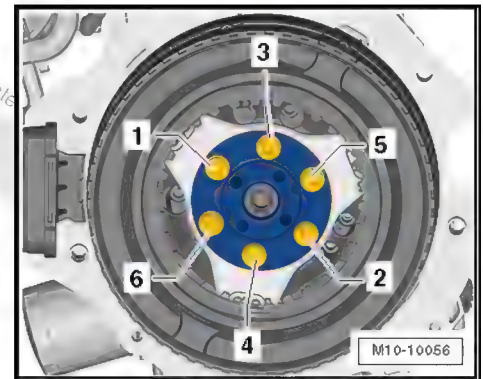
- Tighten the bolts -1 through 6- to the tightening specification. Refer to [-2.1 Cylinder Block, Transmission Side-, page 119](#).

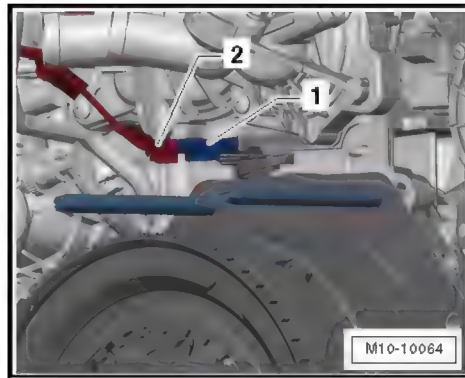
## New Needle Bearing, Installing

- Carefully drive the new needle bearing -2- into the hub -3- using the Bearing Installer - Crankshaft Pilot Bearing -3264- -1-.

Installation depth dimension -a- = 0.0 mm.

- Measure the installation depth constantly while installing.
- Bearings that have been installed too deep must be replaced.
- Connect the connector -2- to the Drive Motor Temperature Sensor -G712- -1-.





- Connect the transmission to the engine. Refer to ➤ Rep. Gr. 34; Transmission, Removing and Installing; Transmission, Installing.

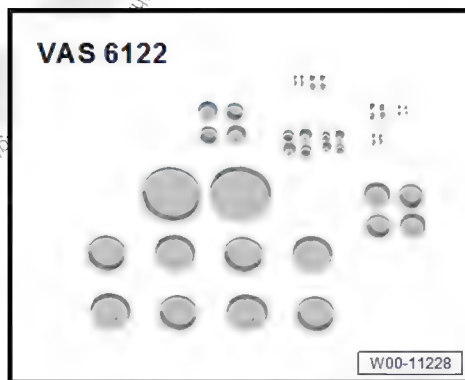
## 1.5.2 Electric Drive Motor -V141-, Attaching to Engine, Reinstalling Electric Drive Motor -V141-

Special tools and workshop equipment required

- ◆ Used Oil Collection and Extraction Unit -SMN372500-



- ◆ Engine Bung Set -VAS 6122-







◆ Shop Crane - Drip Tray -VAS 6208-

**VAS 6208**



W00-11209

◆ Scissor Lift Table -VAS 6131 B-

**VAS 6131 B**



W00-11477

◆ Hose Clip Pliers -VAS 6362-

**VAS 6362**



W00-11227

◆ Counter Support -VAS 251 621-



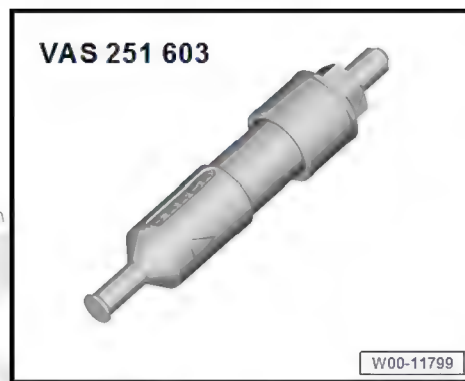
**VAS 251 621**



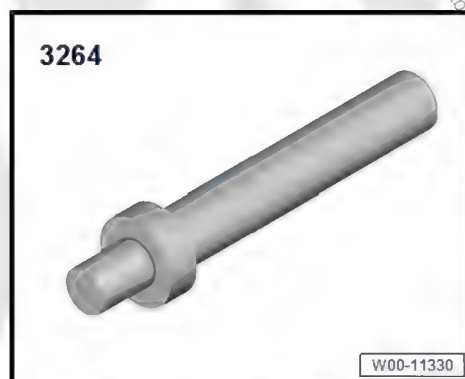
W00-11824



◆ Internal Puller - VAS 251 603-



◆ Bearing Installer - Crankshaft Pilot Bearing -3264-



◆ Centering Mandrel -T10515-



◆ Commercially available Step Ladder



◆ Protective Eyewear

◆ Safety Gloves

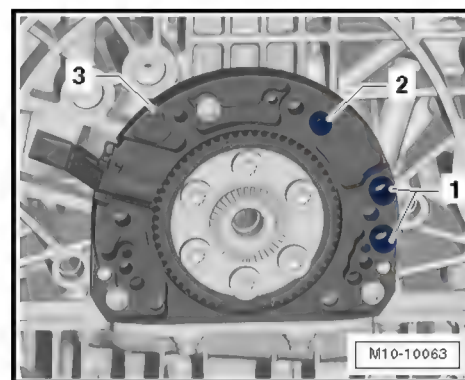
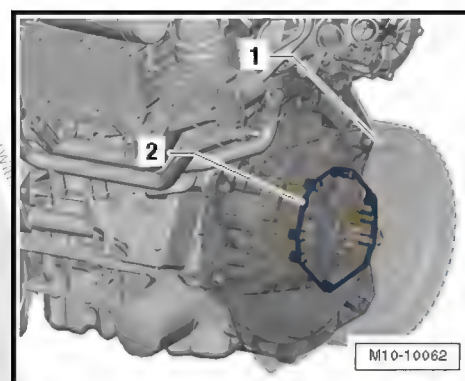


## Note

- ◆ *Danger of damaging the components.*
- ◆ *When installing the Electric Drive Motor -V141-, the engine must be secured with the Scissor Lift Table - Q7 Set - Articulated Joint Support -VAS 6131/13-7- on the Scissor Lift Table -VAS 6131B-.*
- ◆ *Counterhold the central bolt with the Counterhold - Electric Drive -T10516- and a suitable lever when securing.*
- ◆ *Attach the Electric Drive Motor -V141- to the engine only with the Centering Mandrels -T10515- installed.*

## Removing

- A plastic retainer -2- holds the bolts in the Electric Drive Motor -V141- in place.
- Remove all of the plugs and protective film from the Electric Drive Motor -V141- and engine.
- Remove the sealing bushings -1 and 2- from the sealing flange -3-.

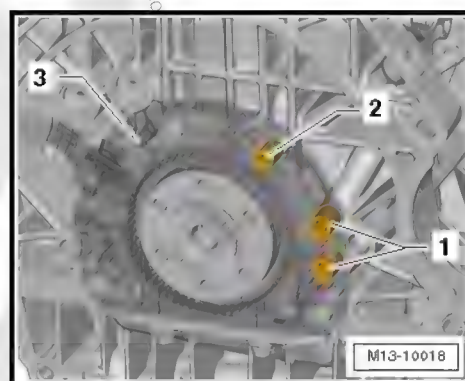


- If it is difficult to move the Internal Puller -VAS 251 603- and Counter Support -VAS 251 621-, remove the sealing bushings.



#### Note

- ◆ *The sealing bushings are longer than the sealing flange.*
- ◆ *The sealing bushings are supported against both surfaces and seal off the openings when bolting the Electric Drive Motor -V141- to the engine.*
- ◆ *Replace the sealing bushings after each time the Electric Drive Motor -V141- is removed.*
- ◆ *There are different sealing bushings.*
- ◆ *They have different diameters.*
- Install the new sealing bushings for the coolant pass-through -1- and for the decoupler -2-. Refer to the ➔ Electronic Parts Catalog (ETKA).



#### Note

- ◆ *Danger of damaging the components.*
- ◆ *The Electric Drive Motor -V141- is permanently connected to the intermediate plate which must not be damaged.*
- ◆ *Together with the intermediate plate, the Electric Drive Motor -V141- is pulled out and removed from the engine.*
- ◆ *Both technicians are only allowed to touch the unit on the Electric Drive Motor -V141- and not on the intermediate plate.*

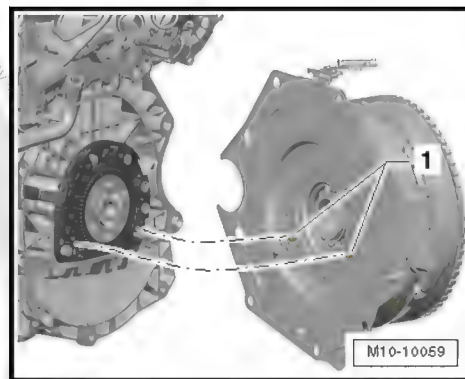


#### Note

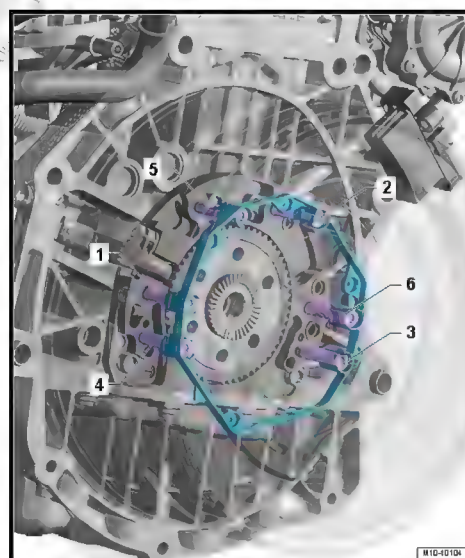
*A second technician will be needed for the following procedure.*

- Both technicians mount the Electric Drive Motor -V141- on the engine without tilting it on the guide.





- Install the Electric Drive Motor -V141- into the centering piece.
- The Electric Drive Motor -V141- is bolted to the engine with the bolts -1 through 6-.



- Only the bolts -1 through 3- are accessible. After turning the Electric Drive Motor -V141-, are the bolts -4 through 6- accessible.

#### Bolt Position 1

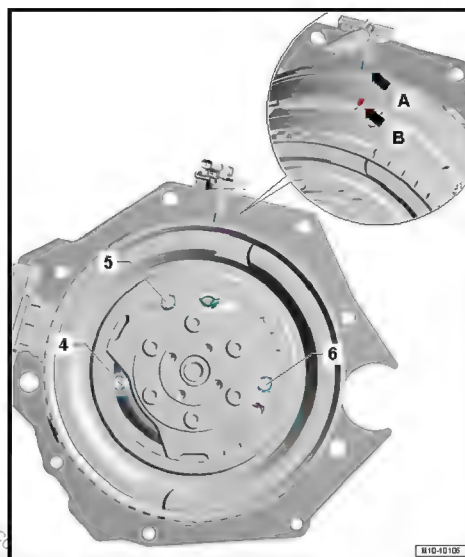




## Note

- ◆ -Arrow A- points to the wire for the Drive Motor Temperature Sensor -G712-
- ◆ -Arrow B- indicates the marking (notch) that is located on the Electric Drive Motor -V141-.
- A pin -arrow- secures a new Electric Drive Motor -V141- from turning.
- It is also possible to determine the bolt positions without the pin via the two markings -arrow A- and -arrow B- when reinstalling.
- The bolts -1 through 3- are only accessible in this position -arrow A- and -arrow B-.
- Hand tighten the bolts -1 through 3- all the way.
- If present, remove the pin -arrow-.

## Bolt Position 2



## Note

- ◆ -Arrow A- points to the wire for the Drive Motor Temperature Sensor -G712-
- ◆ -Arrow B- indicates the marking (notch) that is located on the Electric Drive Motor -V141-.
- Turn the Electric Drive Motor -V141- so that both markings -arrow A- and -arrow B- line up as illustrated.
- The bolts -4 through 6- can now be reached.
- Tighten the bolts -4 through 6- all the way hand-tight.



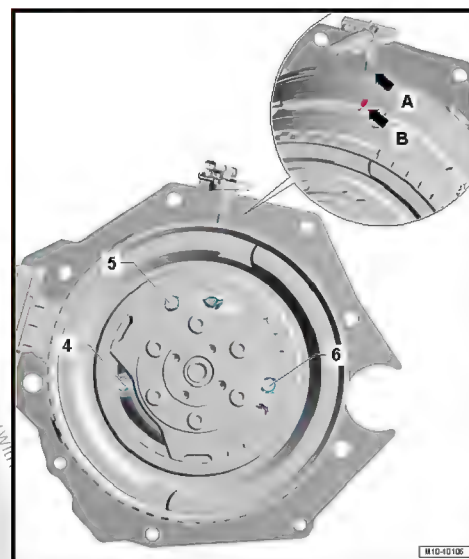


## Bolt Position 1



- Turn the Electric Drive Motor -V141- so that both markings -arrow A- and -arrow B- line up as illustrated.
- Tighten the bolt -1 through 3- to the tightening specification. Refer to ➔ [-2.1 Cylinder Block, Transmission Side”, page 119](#) .

## Bolt Position 2



- Turn the Electric Drive Motor -V141- so that both markings -arrow A- and -arrow B- line up as illustrated.
- Tighten the bolts -4 through 6- to the tightening specification. Refer to ➔ [-2.1 Cylinder Block, Transmission Side”, page 119](#) .

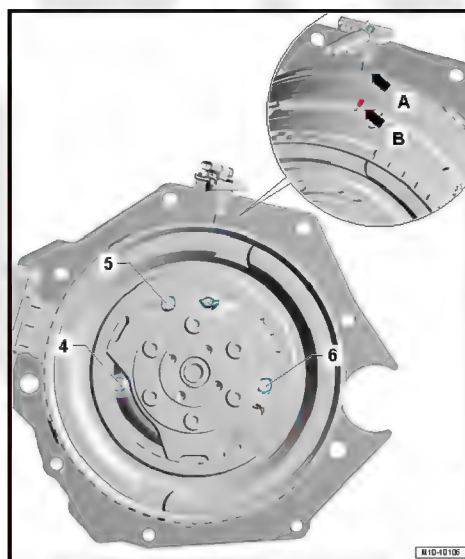


## Bolt Position 1



- Turn the Electric Drive Motor -V141- so that both markings -arrow A- and -arrow B- line up as illustrated.
- Tighten the bolt -1 through 3- to the tightening angle. Refer to ⇒ [-2.1 Cylinder Block, Transmission Side](#), page 119 .

## Bolt Position 2



- Turn the Electric Drive Motor -V141- so that both markings -arrow A- and -arrow B- line up as illustrated.
- Tighten the bolts -4 through 6- with an additional turn. Refer to ⇒ [-2.1 Cylinder Block, Transmission Side](#), page 119 .



### Note

*Use the old shim again if not installing a new Electric Drive Motor -V141-.*

- Mount the hub and the shim on the crankshaft.
- Make sure the teeth on the hub and the teeth on the crankshaft fit correctly. To do this, turn the hub with a light preload until it latches and a torque is felt.



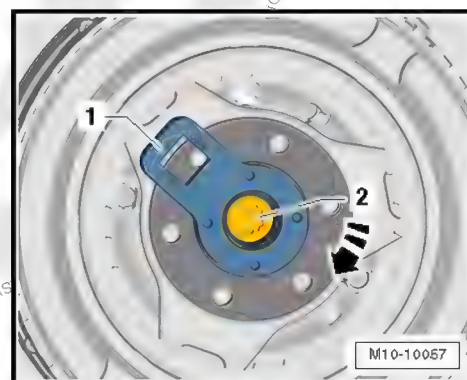


**i** Note

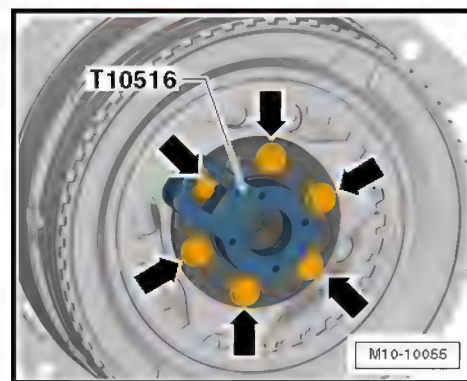
*A second technician will be needed for the following procedure.*

**i** Note

- ◆ *Danger of damaging the components.*
- ◆ *The central bolt -2- has a left-hand thread.*
- ◆ *The correct tools must be used to tighten the central bolt -2- due to the high torque needed.*
- Insert the Counterhold - Electric Drive -T10516- into the hub with a suitable extension and counterhold it when tightening the bolt.

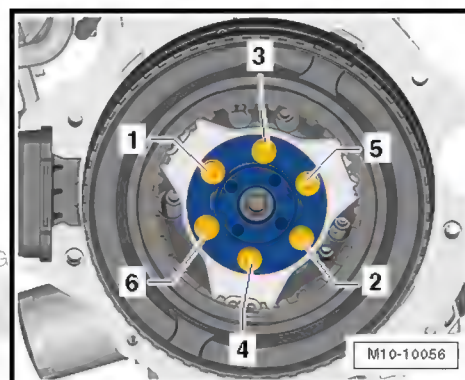


- When tightening the central bolt -2-, counterhold it using the Counterhold - Electric Drive -T10516- so that the drive train does not get pulled out of the engine bracket.
- Tighten the new central bolt. Refer to ➤ [-2.1 Cylinder Block, Transmission Side](#), page 119 .
- Turn the rotor on the Electric Drive Motor -V141- to line up the holes in the clutch plate, the shim and the hub flange.
- Insert the Counterhold - Electric Drive -T10516- into the crankshaft flange using a suitable extension and counterhold while tightening the bolts. At the same time, move the Counterhold - Electric Drive -T10516- to reach all the bolts.



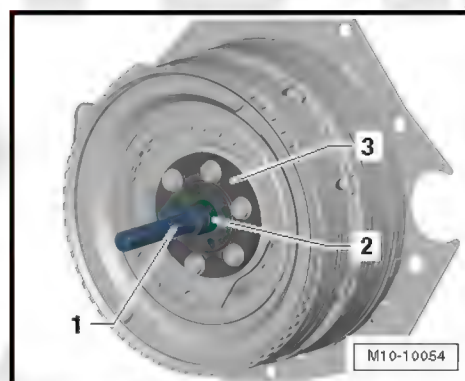


## Note the Tightening Sequence



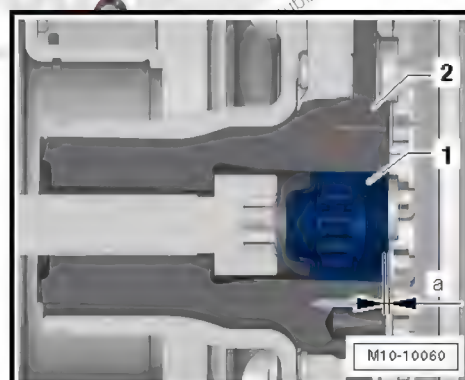
- Tighten the bolts -1 through 6- to the tightening specification. Refer to ➔ [-2.1 Cylinder Block, Transmission Side-, page 119](#).

## New Needle Bearing, Installing

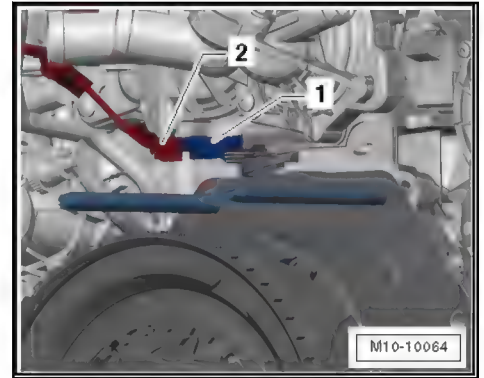


- Carefully drive the new needle bearing into the hub using the Bearing Installer - Crankshaft Pilot Bearing -3264-.

Needle bearing depth -1- inside the flange -2- -a= 0.0 mm.



- Measure the installation depth constantly while installing.
- Bearings that have been installed too deep must be replaced.
- Connect the connector -1- to the Drive Motor Temperature Sensor -G712- -2-.



- Connect the transmission to the engine. Refer to ➔ Rep. Gr. 34; Transmission, Removing and Installing; Transmission, Installing.

## 1.6 Engine, Installing

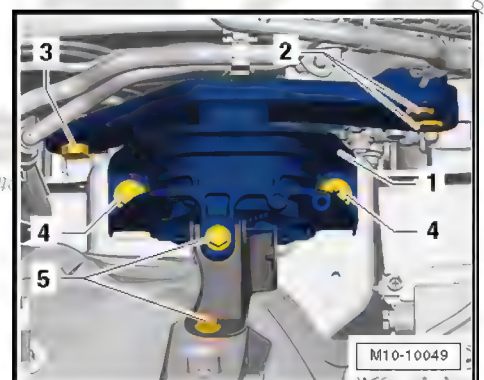
### Procedure

Install in the reverse order of removal while noting the following:

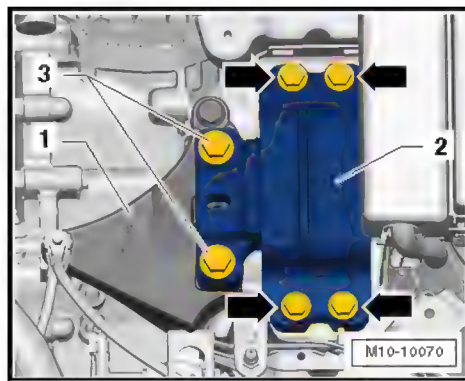


#### Note

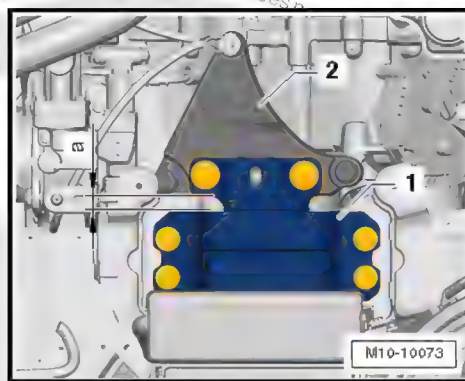
- ◆ *Replace the bolts that were tightened with an additional turn.*
- ◆ *Replace the self-locking nuts and bolts, gaskets, seals and O-rings.*
- ◆ *Secure hose connections with standard production clamps. Refer to the ➔ Electronic Parts Catalog (ETKA).*
- ◆ *During installation, all cable ties must be installed at the same location.*
- With a second technician, guide the engine/transmission assembly into the body using the Scissor Lift Table -VAS 6131B-.
- Install all the engine mount bolts completely by hand.



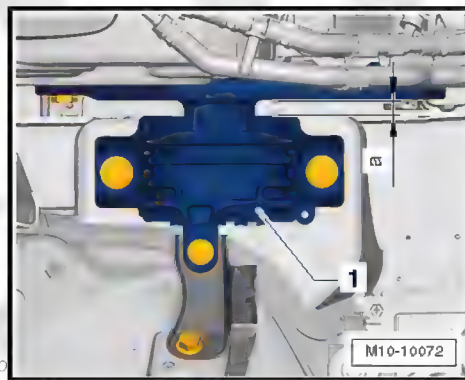
- Tighten the bolts -2 and 3-. The bolt -3- is accessible through the right wheel housing.
- Install the bolts -3- for the transmission mount by hand all the way.



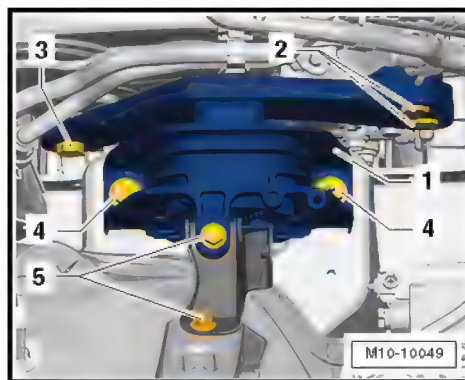
- Align the transmission mount -1- with the transmission bracket -2- so that the distance -a- is the same.



- Align the engine mount -1- so that the distance -a- is the same.



- Tighten the bolts -4-.



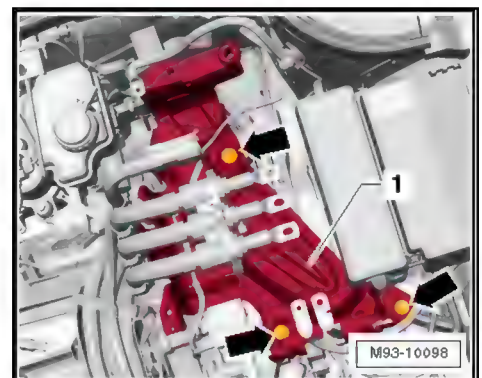
- Install the bracket and tighten the bolts -5-.



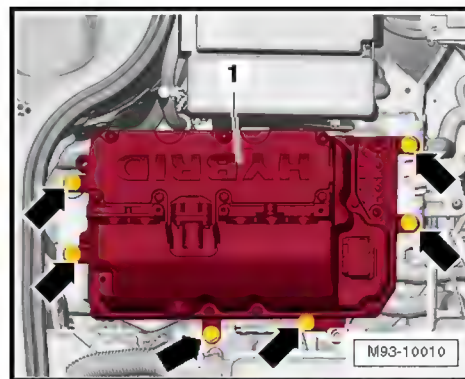
**Note**

*The bolts are only tightened to the final tightening specification after the subframe mounts have been adjusted. Refer to ➤ [M2.5 ount, Adjusting", page 90](#).*

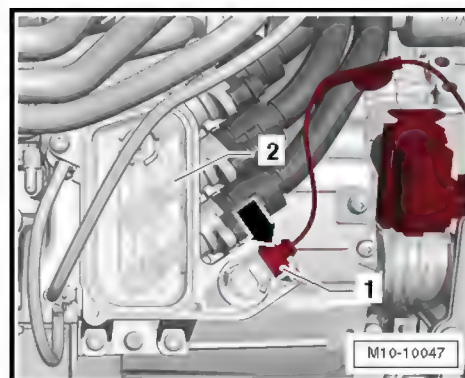
- Remove the Engine Support T10497A from the engine.
- Install the catalytic converter. Refer to ➤ [C2.2 onverter, Removing and Installing", page 419](#).
- Install the drive axles. Refer to ➤ Suspension, Wheels, Steering; Rep. Gr. 40; Drive Axle; Overview - Drive Axle.
- Install the selector lever cable. Refer to ➤ Rep. Gr. 34; Selector Mechanism; Overview - Operating Cables.
- Attach the Electrical A/C Compressor -V470-. Refer to ➤ Heating, Ventilation and Air Conditioning; Rep. Gr. 87; A/C Compressor; A/C Compressor, Removing and Installing on Bracket.
- Electrical connections and routing. Refer to ➤ Electrical Equipment; Rep. Gr. 97; Relay Panels, Fuse Panels and E-Boxes; Component Location Overview - Relay Panels, Fuse Panels and E-Boxes and ➤ Wiring diagrams, Troubleshooting & Component locations.
- Install the Engine Control Module -J623-. Refer to ➤ [E5.1 ngine Control Module J623, Removing and Installing", page 390](#).
- Connect the coolant hoses with the connector coupling. Refer to ➤ [Fig. "Connect the Coolant Hose to the Connector Coupling", page 321](#).
- Install the subframe with the steering gear. Refer to ➤ Suspension, Wheels, Steering; Rep. Gr. 40; Subframe; Subframe and Steering Gear, Removing and Installing.
- Install the wheel housing liner. Refer to ➤ Body Exterior; Rep. Gr. 66; Wheel Housing Liner; Overview - Front Wheel Housing Liner.
- Mount the front wheels. Refer to ➤ Rep. Gr. 44; Wheel and Tire Guide; Wheel, Changing.
- Install the Electric Drive Power and Control Electronics -JX1- bracket. Refer to ➤ Electrical Equipment; Rep. Gr. 93; Electric Drive Power and Control Electronics; Electric Drive Power and Control Electronics, Removing and Installing.



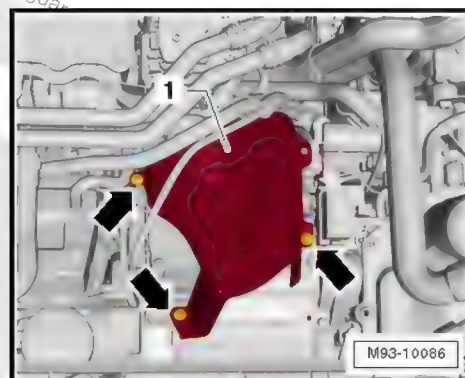
- Install the Electric Drive Power and Control Electronics - JX1-. Refer to ➤ Electrical Equipment; Rep. Gr. 93; Electric Drive Power and Control Electronics; Electric Drive Power and Control Electronics, Removing and Installing.



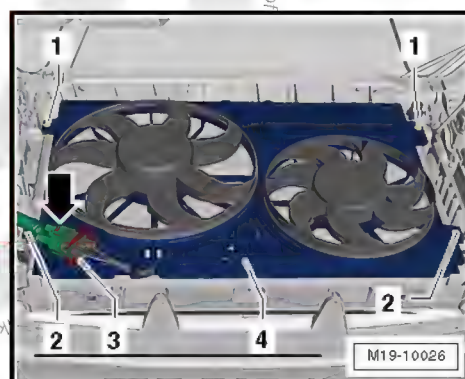
- Connect the connector -1- to the contact switch for the connection box -2- for the Electric Drive Motor -V141-.



- Install the connection box protective plate for the Electric Drive Motor -V141- -1-.



- Install the fan shroud. Refer to [⇒ S4.3 hroud, Removing and Installing](#), [page 324](#) .



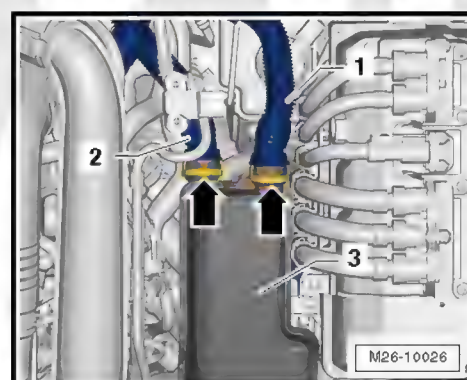
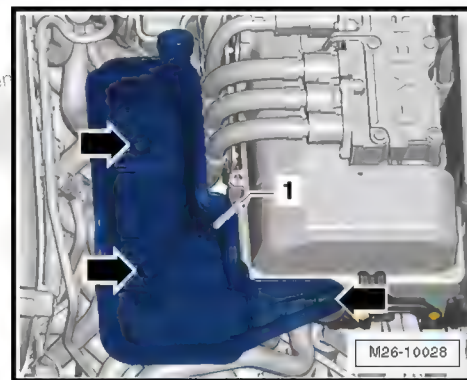
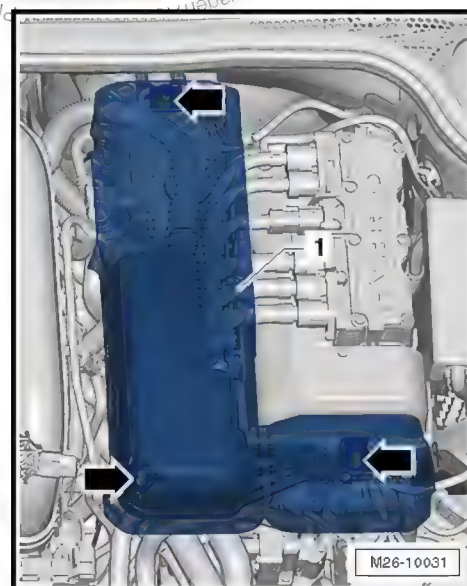
- Fill the coolant. Refer to [⇒ page 279](#) .

**Note**

- ◆ *The drained coolant may be used again only if the cylinder head or the cylinder block were not replaced.*
- ◆ *Do not use dirty coolant again.*

**Vehicles with Secondary Air System**

- Install the damper -1-.
- Attach the air line -1 and 2- to the damper -3-.

**Continuation for All Vehicles**

- Install the damper cover -1-.



- Connect the 12V battery. Refer to ➔ Electrical Equipment; Rep. Gr. 27; Battery; Battery, Disconnecting and Connecting.



### DANGER

Extremely dangerous due to high-voltage.

Severe bodily injury or death by electrocution is possible.

- Have a qualified person put the high-voltage system back into service.

- Bring the high-voltage system back into operation. Refer to ➔ Electrical Equipment; Rep. Gr. 93; High-Voltage System, Re-energizing.

### Tightening Specifications



#### Note

- ◆ The tightening specifications only apply to lightly greased, oiled, phosphated or blackened nuts and bolts.
- ◆ Additional lubricants, such as engine or transmission oil are permissible, although lubricants containing graphite are not.
- ◆ Do not use any ungreated parts.
- ◆ Tightening specification tolerance:  $\pm 15\%$ .

Component		Nm
Bolts and nuts	M 6	9
	M 7	15
	M 8	20
	M 10	40
	M 12	65

- ◆ Refer to ➔ -2.1 Assembly Mounts, page 71.





## 2 Assembly Mounts

⇒ [-2.1 Assembly Mounts", page 71](#)

⇒ [M2.2 ount, Removing and Installing", page 74](#)

⇒ [M2.3 ount, Removing and Installing", page 82](#)

⇒ [S2.4 upport, Removing and Installing", page 90](#)

⇒ [M2.5 ount, Adjusting", page 90](#)

⇒ [M2.6 ount, Checking Adjustment", page 104](#)

### 2.1 Overview - Assembly Mounts





**1 - Bolt**

- ☐ Replace after removing
- ☐ Tightening specification and sequence. Refer to ➤ [Fig. "Pendulum Support", page 73](#).

**2 - Bolt**

- ☐ Replace after removing
- ☐ Tightening specification and sequence. Refer to ➤ [Fig. "Pendulum Support", page 73](#).

**3 - Bolts**

- ☐ Replace after removing
- ☐ Tightening specification and sequence. Refer to ➤ [Fig. "Pendulum Support", page 73](#).

**4 - Pendulum Support**

- ☐ Removing and Installing. Refer to ➤ [S2.4 upport, Removing and Installing", page 90](#).

**5 - Bolt**

- ☐ 40 Nm +90°
- ☐ Replace after removing

**6 - Bolt**

- ☐ 40 Nm +90°
- ☐ Replace after removing
- ☐ Engine mount to engine mount bracket

**7 - Bracket**

**8 - Bolt**

- ☐ 20 Nm +90°
- ☐ Replace after removing

**9 - Bolt**

- ☐ 20 Nm +90°
- ☐ Replace after removing

**10 - Bolt**

- ☐ 40 Nm +90°
- ☐ Replace after removing

**11 - Engine Mount**

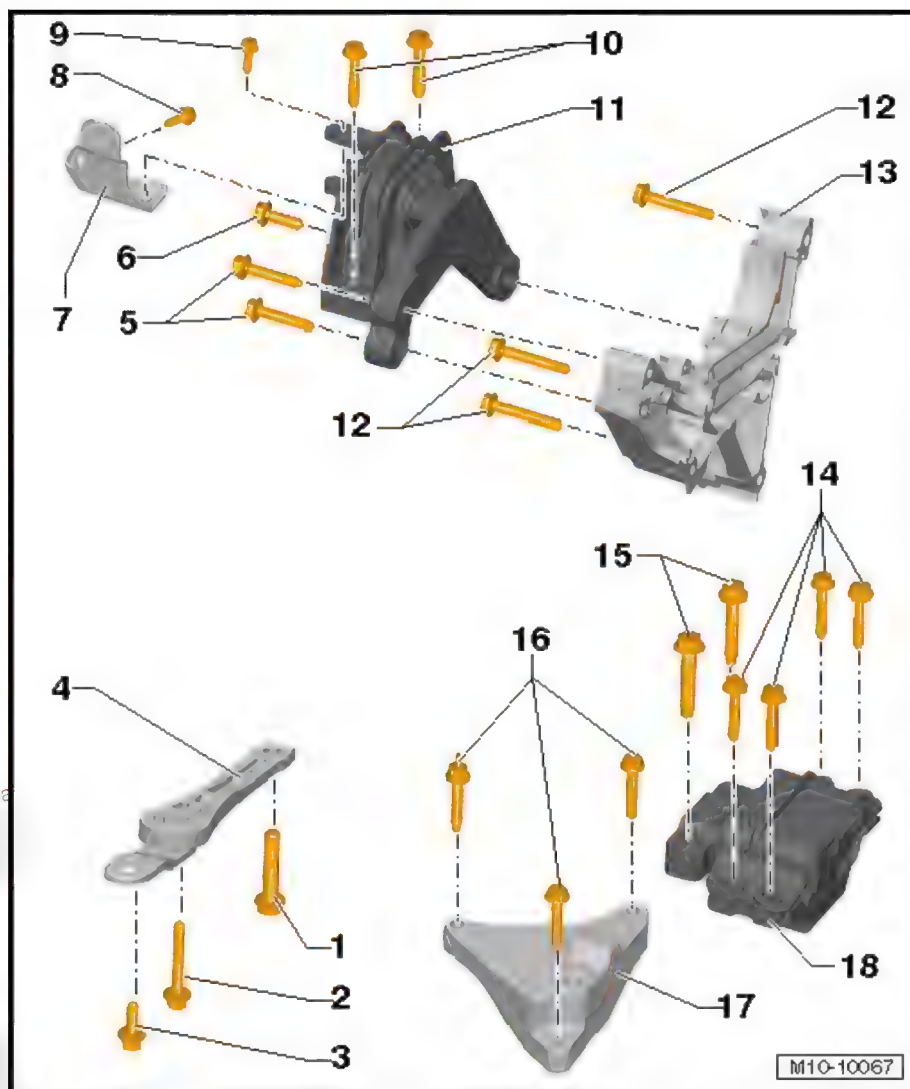
- ☐ With support arm
- ☐ Removing and Installing. Refer to ➤ [M2.3 ount, Removing and Installing", page 74](#).

**12 - Bolt**

- ☐ 40 Nm +90°
- ☐ Replace after removing

**13 - Engine Mount Bracket**

- ☐ Removing and Installing. Refer to ➤ [B1.3 racket, Removing and Installing", page 111](#).



- ☐ Tightening specification and sequence. Refer to ➔ [Fig. “Engine Mount Bracket”, page 73](#).

#### 14 - Bolt

- ☐ 50 Nm + 90°
- ☐ Replace after removing

#### 15 - Bolt

- ☐ 60 Nm + 90°
- ☐ Replace after removing

#### 16 - Bolt

- ☐ 40 Nm + 90°
- ☐ Replace after removing

#### 17 - Transmission Bracket

#### 18 - Transmission Mount

- ☐ With support arm
- ☐ Removing and Installing. Refer to ➔ [M2.3 Mount, Removing and Installing”, page 82](#).

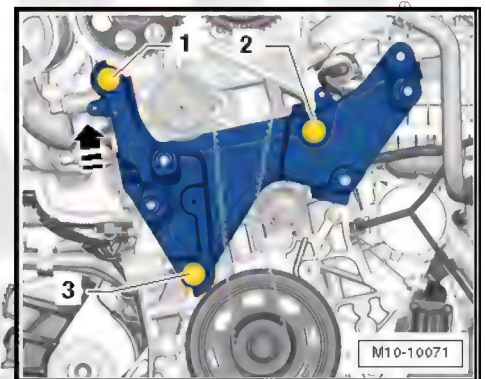


#### Note

*Replace the bolts that were tightened with an additional turn.*

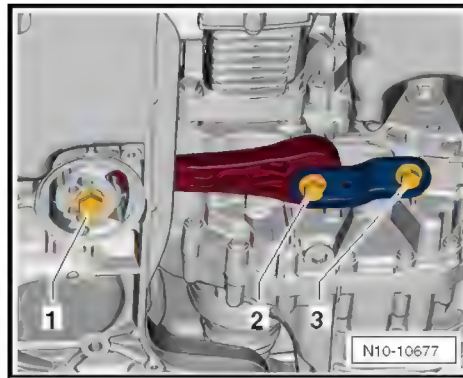
- Tighten the bolts in the steps in the sequence shown:

#### Engine Mount Bracket



Step	Component	Tightening Specification/Additional Turn
1	Bolts -1 through 3-	Install loosely
2	Bolts -1 through 3-	Push the engine mount bracket upward in direction of -arrow- and tighten it hand-tight so that it cannot move anymore.
3	Bolts -1 through 3-	Tighten to 40 Nm
4	Bolts -1 through 3-	90° additional turn

#### Pendulum Support



#### Note

*Replace the bolts that were tightened with an additional turn.*

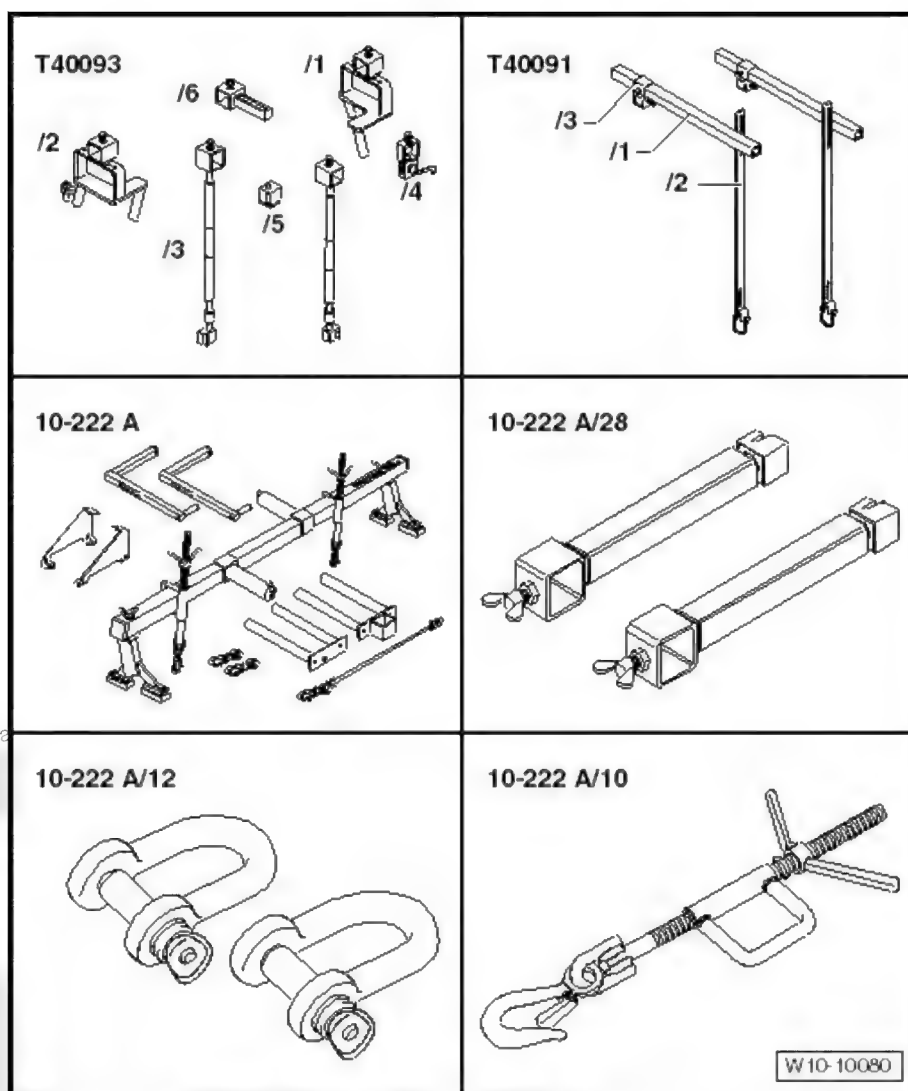
- Tighten the bolts in the steps in the sequence shown:

Step	Component	Tightening Specification/Additional Turn
1	Bolts -2 and 3-	50 Nm
2	Screw -1-	130 Nm
3	Bolts -1 through 3-	90° additional turn

## 2.2 Engine Mount, Removing and Installing



# Special tools and workshop equipment required

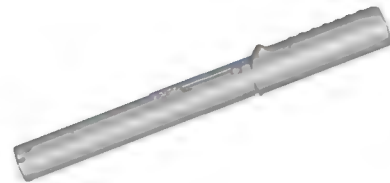


- ◆ Engine Support Bridge -10 - 222 A-
- ◆ Engine Support - Automatic Transmission Hook -10 - 222 A/7-
- ◆ Engine Support - Bracket w/Spindle and Hook -10 - 222 A/10-
- ◆ Engine Support Bridge - Engine Support 28 -10 - 222 A /28-
- ◆ Engine Support Bridge - Engine Support 31 -10 - 222 A /31-
- ◆ Rail with Holes -T40091/2- from Engine Support - Basic Set -T40091-
- ◆ Engine Support - Supplement Kit Mount 5 -T40093/5- from the Engine Support - Supplement Kit -T40093A-
- ◆ Engine Support Bridge - Engine Support 28-2 -10 - 222 A / 28-2- (quantity 2)
- ◆ Square Pipe -T40091/1- (quantity 2) from the Engine Support - Basic Set -T40091-
- ◆ Movable Joint -T40091/3- (quantity 2) from the Engine Support - Basic Set -T40091-



- ◆ Movable Joint -T40093/4- (quantity 2) from the Engine Support - Supplement Kit -T40091-
- ◆ Torque Wrench 1331 5-50Nm -V.A.G 1331-

V.A.G 1331



W00-11166

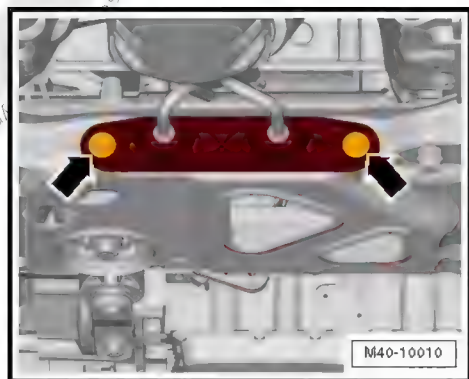
## Removing

- Remove the resonator for the intake air scoop. Refer to ⇒ [A2.3 ir Scoop Resonator, Removing and Installing", page 371](#) .
- Remove the air filter housing. Refer to ⇒ [F2.2 ilter Housing, Removing and Installing", page 370](#) .
- Remove the noise insulation. Refer to ⇒ [Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation](#).



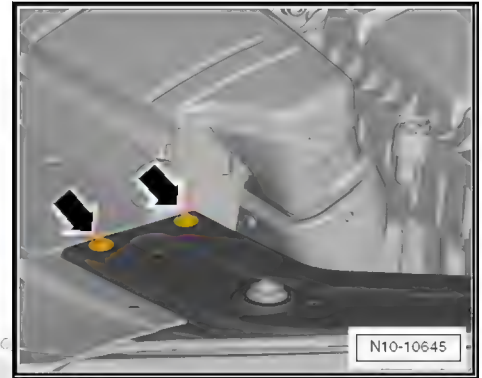
## Note

- ◆ *There is a risk of damaging the decoupling element.*
- ◆ *Do not bend the decoupling element more than 10°.*
- ◆ *Do not stretch the decoupling element.*
- ◆ *Do not damage the wire mesh on the decoupling element.*
- Remove the exhaust system bracket from the subframe -arrows-.

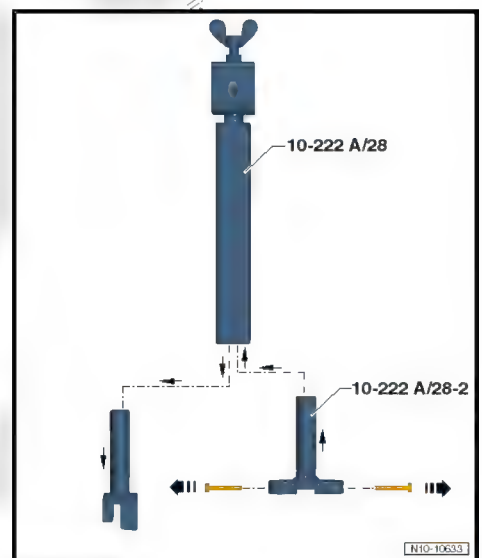


M40-10010

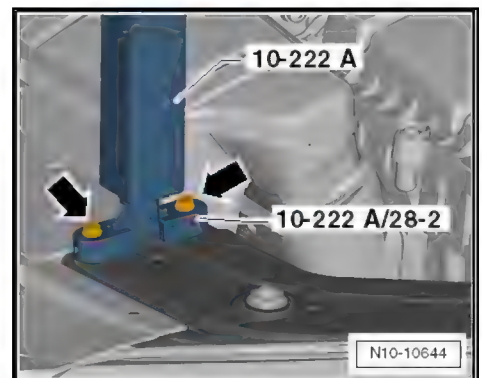
- Remove the plenum chamber cover. Refer to ⇒ [Body Exterior; Rep. Gr. 50; Bulkhead; Plenum Chamber Cover, Removing and Installing](#).
- Remove the bolts -arrows- for the lock carrier retaining bracket on the left and right sides



- Remove the lower mounts on the Engine Support Bridge - Engine Support 28 -10-222 A /28- and replace with the Engine Support Bridge - Engine Support 28-2 -10-222 A /28-2-.



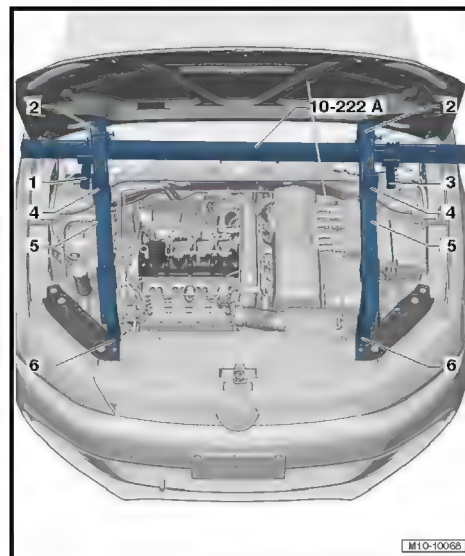
- Remove the bolts -arrows- for securing the engine support bridge on the lock carrier from the Engine Support Bridge - Engine Support 28-2 -10-222 A /28-2-.
- Use the bolts from the Engine Support Bridge - Engine Support 28-2 -10-222 A /28-2- for attaching the Engine Support Bridge - Engine Support 28 -10 - 222 A /28-. Do not use the bolts for the retaining bracket.



- Tighten the fastening bolts -arrows- to 8 Nm.
- A second technician is needed to mount the Engine Support Bridge on the vehicle to prevent the Engine Support Bridge from tipping.



Mount the engine support bridge as follows to support the engine/transmission assembly:

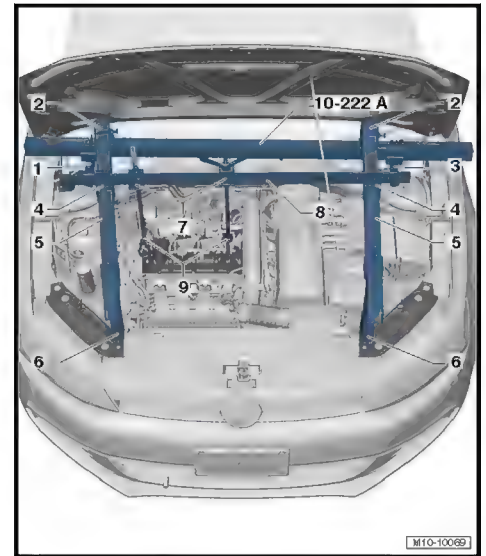


- 1 - Engine Support Bridge - Engine Support 31 Adapter 31-2 -10 - 222 A /31-2-
- 2 - Engine Support - Basic Set - Movable Joint -T40091/3-
- 3 - Engine Support Bridge - Engine Support 31 Adapter 31-1 -10 - 222 A /31-1-
- 4 - Engine Support - Supplement Kit - Movable Joint - T40093/4-
- 5 - Engine Support - Basic Set - Square Pipe -T40091/1-
- 6 - Engine Support Bridge - Engine Support 28 -10 - 222 A /28- with Engine Support Bridge - Engine Support 28-2 -10-222 A /28-2-

- First slide the Movable Joints -item 2- onto the Square Pipe of the Engine Support Bridge -10 - 222 A-.
- The bolts for the Engine Support - Joint Fixture -T40091/3- -item 2- on the Engine Support Bridge -10-222 A- point in the direction of travel.
- Mount the Engine Support Bridge -10-222 A- on the suspension strut towers and have a second technician hold it to prevent it from falling over.
- Slide the Square Pipe -T40091/1- -item 5- on the left and right sides through the Engine Support Bridge - Engine Support 28 -10-222 A /28- -item 6- from the front and position the Movable Joints -T40093/4- -item 4- on each side.
- Slide the Rail with Holes -T40091/2- -item 8- with the Mounts -T40093/5- -item 7- into the Movable Joints -T40093/4- -item 4-.

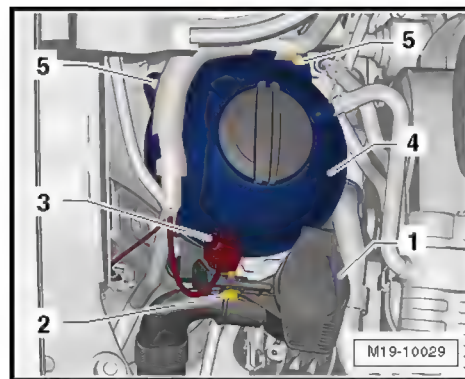




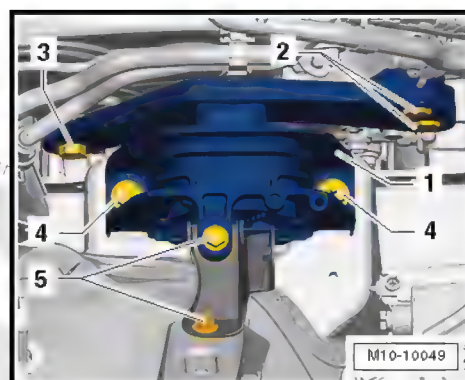


- 1 - Engine Support Bridge - Engine Support 31 Adapter 31-2 -10 - 222 A /31-2-
  - 2 - Engine Support - Basic Set - Movable Joint -T40091/3-
  - 3 - Engine Support Bridge - Engine Support 31 Adapter 31-1 -10 - 222 A /31-1-
  - 4 - Engine Support - Supplement Kit - Movable Joint - T40093/4-
  - 5 - Engine Support - Basic Set - Square Pipe -T40091/1-
  - 6 - Engine Support Bridge - Engine Support 28 -10 - 222 A /28- with Engine Support Bridge - Engine Support 28-2 -10-222 A /28-2-
  - 7 - Engine Support - Supplement Kit - Mount -T40093/5-
  - 8 - Engine Support - Basic Set - Rail with Holes -T40091/2-
  - 9 - Engine Support Bridge - Spindle -10 - 222 A /11-
- Insert the locking pins into the Rail with Holes -T40091/2- -8- and secure with cotter pins.
  - Tighten all threaded connections on the Engine Support Bridge hand-tight. While doing so, adjust the height of the Engine Support Bridge parallel over the Engine Support Bridge - Engine Support 28 -10 - 222 A /28-.
  - Lightly pretension the engine/transmission assembly via the Engine Support Bridge - Spindles -10 - 222 A /11- -9-, but do not lift.
  - Disconnect the connector -3- from the coolant reservoir sensor.





- Remove the bolt -2- and move the windshield washer fluid reservoir filler tube forward -1-.
- Remove the bolts -5- and place the coolant expansion tank -4- on top of the engine with the hoses connected.
- Remove the right front wheel housing liner. Refer to ➔ Body Exterior; Rep. Gr. 66; Wheel Housing Liner; Overview - Front Wheel Housing Liner.
- Remove the bolts -5- and the bracket.



- Remove the bolts -2 and 3-. The bolt is accessible through the right wheel housing.
- Remove the engine mount bolts -4- completely and then remove the engine mount -1-.

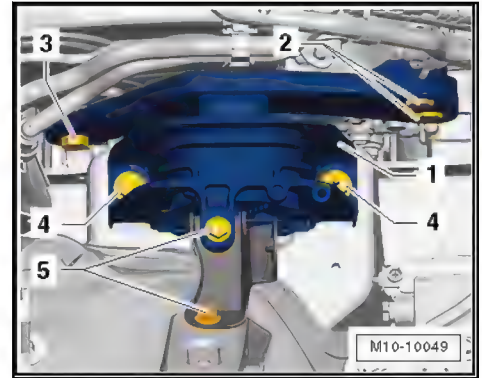
### Installing

Install in the reverse order of removal while noting the following:

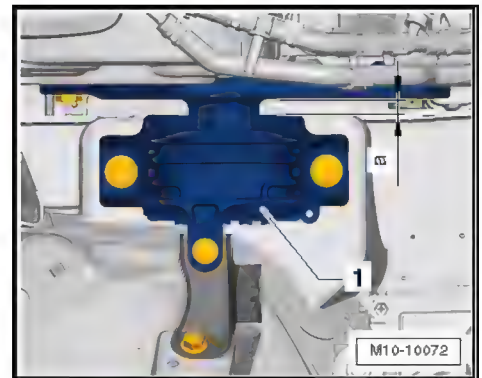
For all repair work, especially in the engine compartment due to the tight working conditions, observe the following:

- ◆ Route all wires and lines so that the original path is followed.
- ◆ Make sure that there is sufficient clearance to all moving or hot components.
- Install all the engine mount bolts completely by hand.

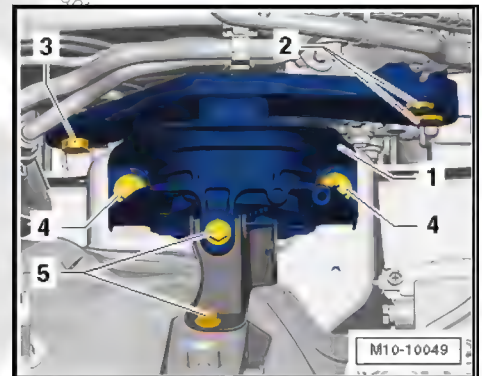




- Tighten the bolts -2 and 3-. The bolt -3- is accessible through the right wheel housing.
- Align the engine mount -1- so that the distance -a- is the same and is minimum 10 mm.



- Tighten the bolts -4-.



- Install the bracket and tighten the bolts -5-.



#### Note

*The bolts are only tightened to the final tightening specification after the subframe mounts have been adjusted. Refer to ➔ [M2.5 ount, Adjusting", page 90](#) .*

- Check the adjustment of the subframe mount. Refer to ➔ [M2.6 ount, Checking Adjustment", page 104](#) .

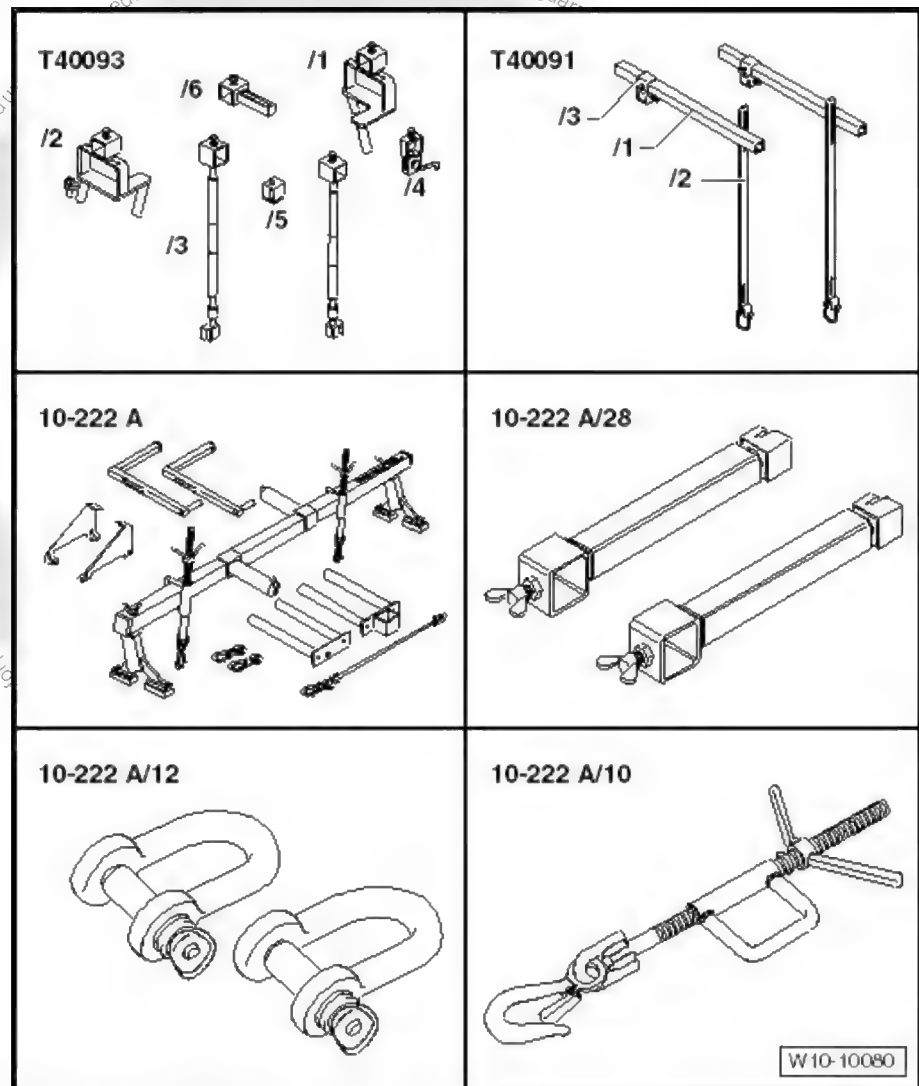
#### Tightening Specifications

- ◆ Refer to ➔ [-2.1 Assembly Mounts", page 71](#) .



## 2.3 Transmission Mount, Removing and Installing

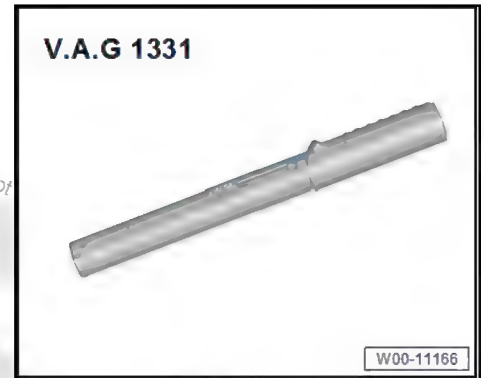
Special tools and workshop equipment required



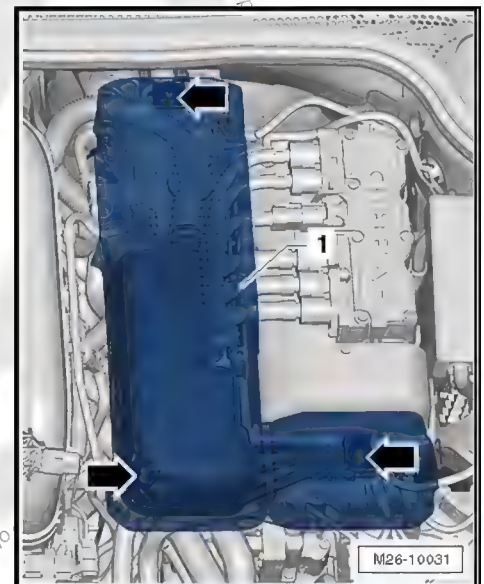
- ◆ Engine Support Bridge -10 - 222 A-
- ◆ Engine Support - Automatic Transmission Hook -10 - 222 A /7-
- ◆ Engine Support - Bracket w/Spindle and Hook -10 - 222 A /10-
- ◆ Engine Support Bridge - Engine Support 28 -10 - 222 A /28-
- ◆ Engine Support Bridge - Engine Support 31 -10 - 222 A /31-
- ◆ Engine Support - Basic Set - Rail with Holes -T40091/2-
- ◆ Engine Support - Basic Set -T40091-
- ◆ Engine Support - Supplement Kit Mount 5 -T40093/5- from the Engine Support - Supplement Kit -T40093A-
- ◆ Engine Support Bridge - Engine Support 28-2 -10 - 222 A / 28-2- (quantity 2)
- ◆ Square Pipe -T40091/1- (quantity 2) from the Engine Support - Basic Set -T40091-



- ◆ Movable Joint -T40091/3- (quantity 2) from the Engine Support - Basic Set -T40091-
- ◆ Movable Joint -T40093/4- (quantity 2) from the Engine Support - Supplement Kit -T40091-
- ◆ Torque Wrench 1331 5-50Nm -V.A.G 1331-

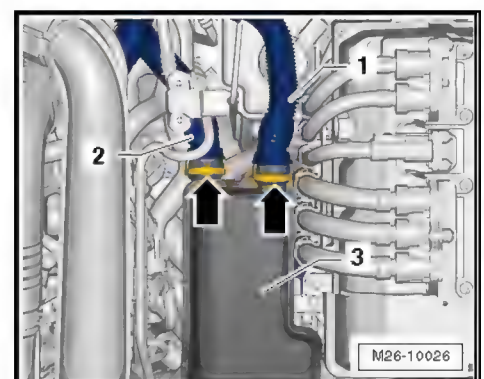


## Removing



- Unclip and remove the damper cover -1- upward from the retainers -arrows-.

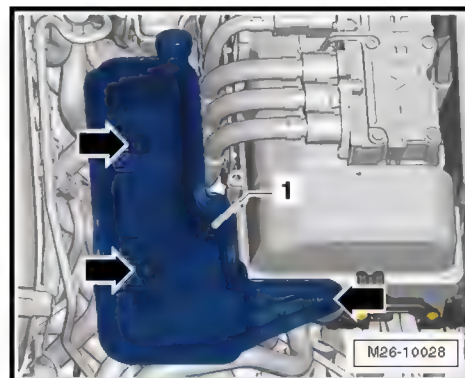
## Vehicles with Secondary Air System



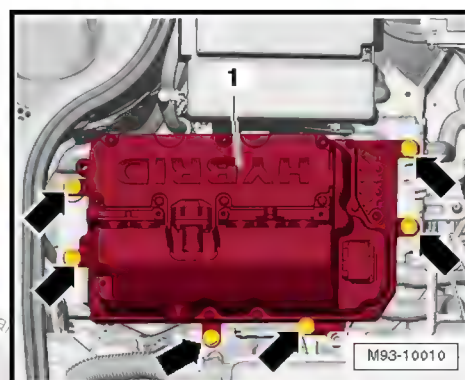
- Squeeze the locking ring -arrows- on both sides and remove the air lines -1 and 2- from the damper -3-.



- Remove the damper -1- upward from the rubber bushings -arrows-.



Continuation for All Vehicles



**⚠ DANGER**

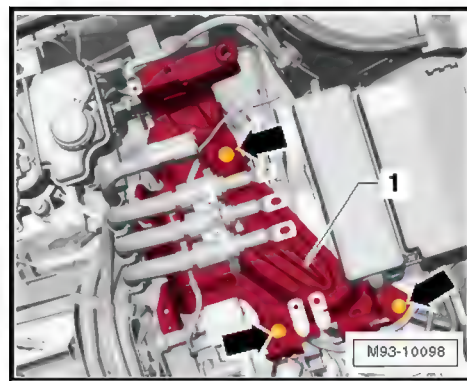
**Extremely dangerous due to high-voltage.**

**Electrocution can cause death or very serious personal injury.**

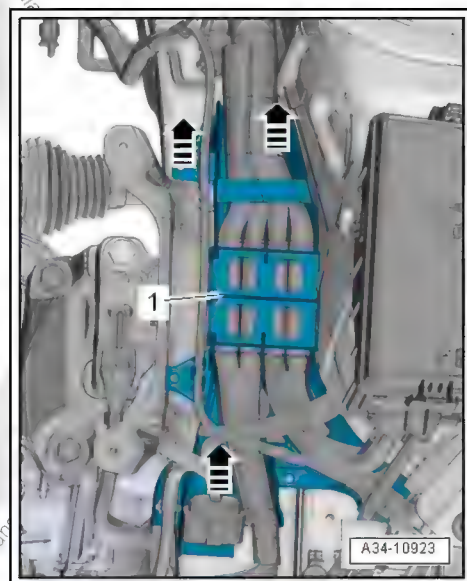
- Have the high-voltage system de-energized by a qualified person.

- Disable the high-voltage system. Refer to ⇒ Electrical Equipment; Rep. Gr. 93; High-Voltage System, Disabling.
- Remove the Electric Drive Power and Control Electronics -JX1-. Refer to ⇒ Electrical Equipment; Rep. Gr. 93; Electric Drive Power and Control Electronics; Electric Drive Power and Control Electronics, Removing and Installing.
- Remove the Electric Drive Power and Control Electronics -JX1- bracket. Refer to ⇒ Electrical Equipment; Rep. Gr. 93; Electric Drive Power and Control Electronics; Electric Drive Power and Control Electronics, Removing and Installing.

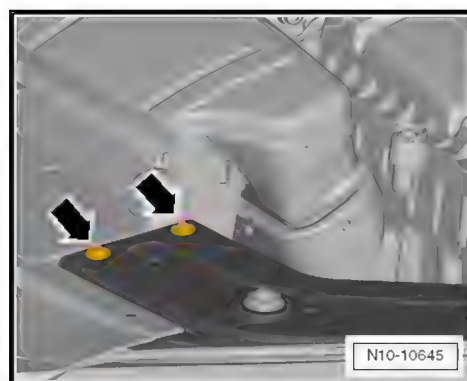




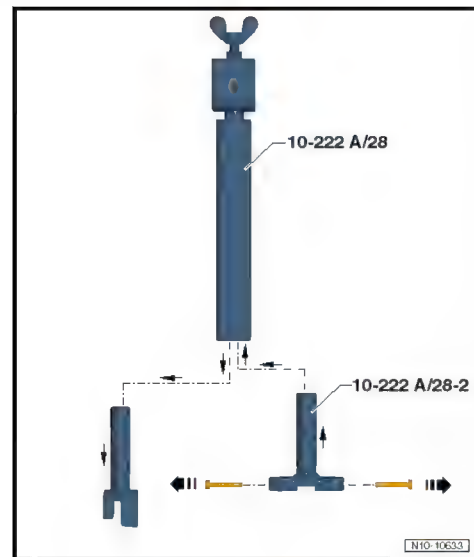
- Unclip the wiring guide -1- upward in direction of -arrows- and move it slightly to the side.



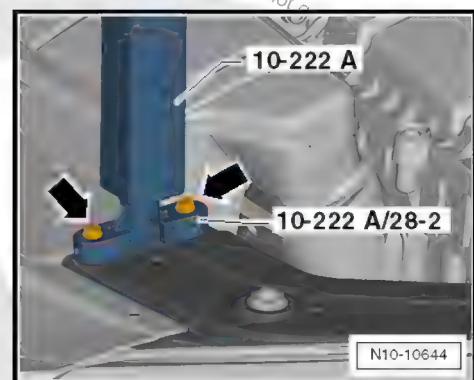
- Remove the bolts -arrows- for the lock carrier retaining bracket on the left and right sides



- Remove the lower mounts on the Engine Support Bridge - Engine Support 28 -10 - 222 A /28- and replace with the Engine Support Bridge - Engine Support 28-2 -10 - 222 A / 28-2-.



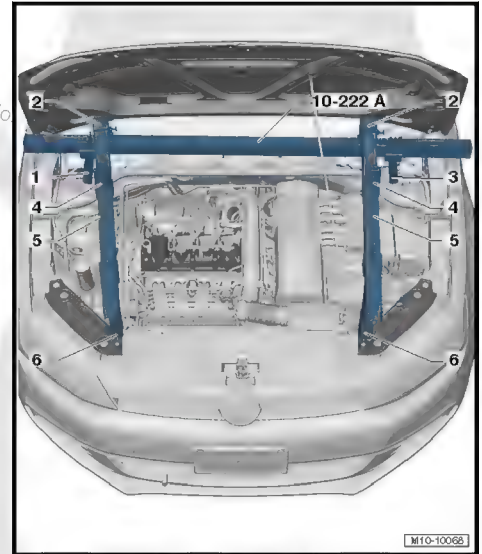
- Remove the bolts -arrows- for securing the engine support bridge on the lock carrier from the Engine Support 28-2 -10-222 A /28-2-.
- Use the bolts from the Engine Support Bridge - Engine Support 28-2 -10-222 A /28-2- for attaching the Engine Support Bridge - Engine Support 28 -10 - 222 A /28-. Do not use the bolts for the retaining bracket since they are too short.
- Install the Engine Support Bridge - Engine Support 28 -10 - 222 A /28- and tighten the bolts -arrows-.



- Bolt tightening specification -arrows- 8 Nm
- A second technician is needed to mount the Engine Support Bridge on the vehicle to prevent the Engine Support Bridge from tipping.

Mount the engine support bridge as follows to support the engine/transmission assembly:





- 1 - Engine Support Bridge - Engine Support 31 Adapter 31-2 -10 - 222 A /31-2-
  - 2 - Engine Support Basic Set - Movable Joint -T40091/3-
  - 3 - Engine Support Bridge - Engine Support 31 Adapter 31-1 -10 - 222 A /31-1-
  - 4 - Engine Support - Supplement Kit - Movable Joint - T40093/4-
  - 5 - Engine Support - Basic Set - Square Pipe -T40091/1-
  - 6 - Engine Support Bridge - Engine Support 28 -10 - 222 A /28- with Engine Support Bridge - Engine Support 28-2 -10-222 A /28-2-
- First slide the Movable Joints -2- onto the Square Pipe of the Engine Support Bridge -10 - 222 A-.
  - The bolts for the Engine Support - Joint Fixture -T40091/3- -2- on the Engine Support Bridge -10-222 A- point in the direction of travel.
  - Mount the Engine Support Bridge -10-222 A- on the suspension strut towers and have a second technician hold it to prevent it from falling over.
  - Slide the Square Pipe -T40091/1- -5- on the left and right sides through the Engine Support Bridge - Engine Support 28 -10-222 A /28- -6- from the front and position the Movable Joints -T40093/4- -4- on each side.
  - Slide the Rail with Holes -T40091/2- -8- with the Mounts -T40093/5- -7- into the Movable Joints -T40093/4- -4-.



-

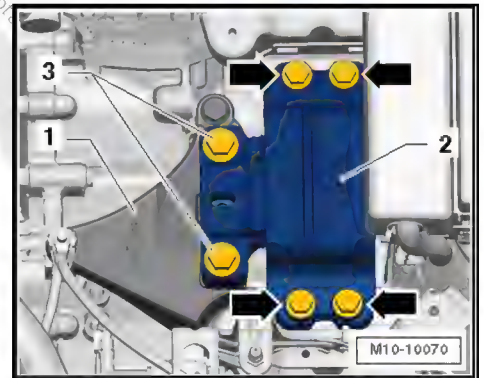
- Remove the bolts -arrows- and the transmission mount -2-.

### Installing

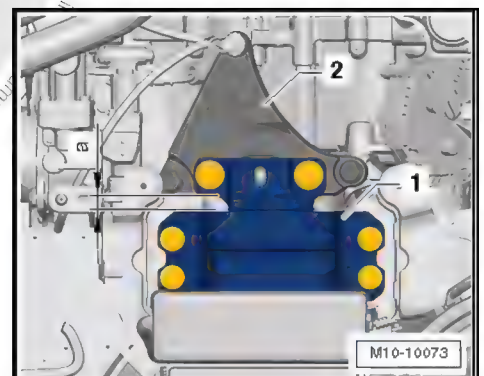
Install in the reverse order of removal while noting the following:

#### Note

- ◆ *Risk of damaging threads in transmission support by inserting bolts at an angle.*
- ◆ *Replace the bolts that were tightened with an additional turn.*
- ◆ *The transmission support and the transmission mount support arm must be absolutely parallel to each other before installing bolts -arrows 1-. Push the rear of the transmission upward using a floor jack if necessary.*
- ◆ *Only remove the Engine Support Bridge -10 - 222 A- when bolts for the assembly mounts are tightened to tightening specification.*
- Lift the transmission using the engine support bridge spindle until the transmission support touches the support arm.
- Install the bolts -3- for the transmission mount by hand all the way.



- Align the transmission mount -1- with the transmission bracket -2- so that the distance -a- is the same and is at least 10 mm.



- Remove the Engine Support Bridge -10 - 222 A- from the engine.

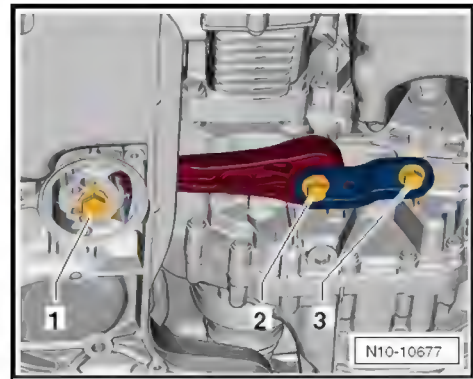
### Tightening Specifications

- ◆ Refer to ➤ [-2.1 Assembly Mounts](#), page 71



## 2.4 Pendulum Support, Removing and Installing

- Remove the noise insulation. Refer to ➤ Body Exterior; Rep. Gr. 66; Noise Insulation; Noise Insulation, Removing and Installing.
- Remove the bolts -1, 2 and 3- and remove the pendulum support.



### Installing

Install in the reverse order of removal while noting the following:

#### Tightening Specifications

- ◆ Refer to ➤ Fig. [“Pendulum Support”](#), page 73

## 2.5 Assembly Mount, Adjusting

➤ [M2.5.1 ount, Adjusting, Engine Mount”, page 90](#)

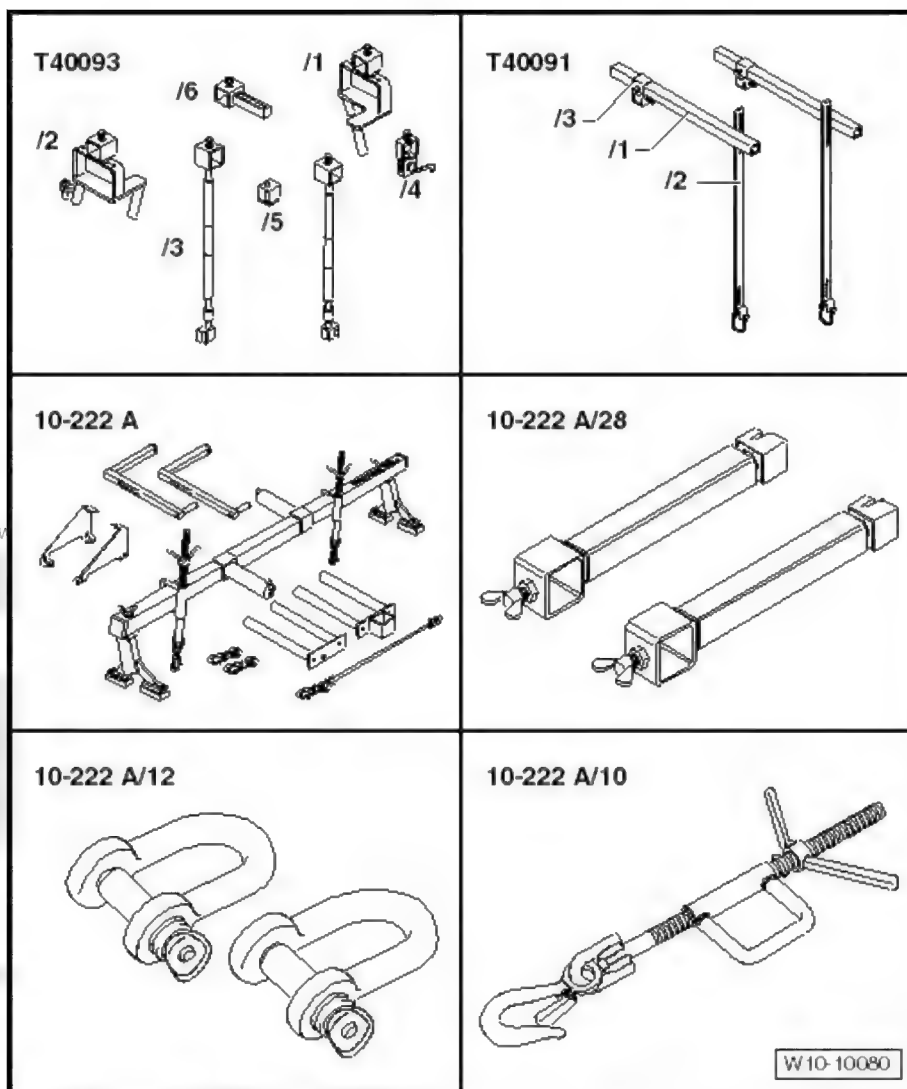
➤ [M2.5.2 ount, Adjusting, Transmission Mount”, page 97](#)

### 2.5.1 Subframe Mount, Adjusting, Engine Mount





### Special tools and workshop equipment required



- ◆ Engine Support Bridge -10 - 222 A-
- ◆ Engine Support - Automatic Transmission Hook -10 - 222 A /7-
- ◆ Engine Support - Bracket w/Spindle and Hook -10 - 222 A /10-
- ◆ Engine Support Bridge - Engine Support 28 -10 - 222 A /28-
- ◆ Engine Support Bridge - Engine Support 31 -10 - 222 A /31-
- ◆ Rail with Holes -T40091/2- from Engine Support - Basic Set -T40091-
- ◆ Engine Support - Supplement Kit Mount 5 -T40093/5- from the Engine Support - Supplement Kit -T40093A-
- ◆ Engine Support Bridge - Engine Support 28-2 -10 - 222 A / 28-2- (quantity 2)
- ◆ Square Pipe -T40091/1- (quantity 2) from the Engine Support - Basic Set -T40091-
- ◆ Movable Joint -T40091/3- (quantity 2) from the Engine Support - Basic Set -T40091-



- ◆ Movable Joint -T40093/4- (quantity 2) from the Engine Support - Supplement Kit -T40091-
- ◆ Torque Wrench 1331 5-50Nm -V.A.G 1331-



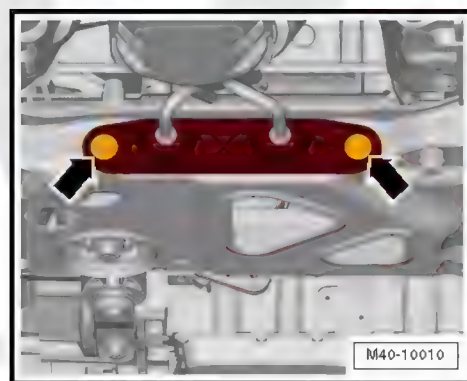
### Removing

- Remove the resonator for the intake air scoop. Refer to ⇒ [A2.3 in Scoop Resonator, Removing and Installing", page 371](#) .
- Remove the air filter housing. Refer to ⇒ [F2.2 ilter Housing, Removing and Installing", page 370](#) .
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation.



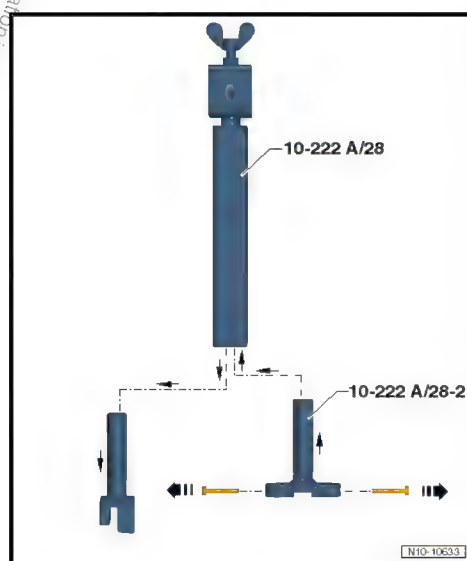
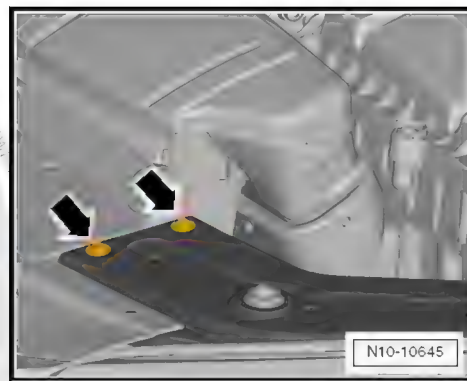
### Note

- ◆ *There is a risk of damaging the decoupling element.*
- ◆ *Do not bend the decoupling element more than 10°.*
- ◆ *Do not stretch the decoupling element.*
- ◆ *Do not damage the wire mesh on the decoupling element.*
- Remove the exhaust system bracket from the subframe -arrows-.

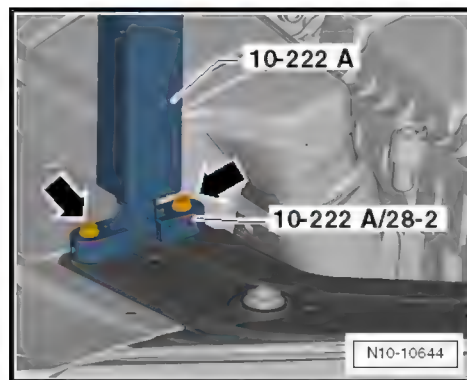


- Remove the plenum chamber cover. Refer to ⇒ Body Exterior; Rep. Gr. 50; Bulkhead; Plenum Chamber Cover, Removing and Installing.
- Remove the bolts -arrows- for the lock carrier retaining bracket on the left and right sides

- Remove the lower mounts on the Engine Support Bridge - Engine Support 28 -10 - 222 A /28- and replace with the Engine Support Bridge - Engine Support 28-2 -10-222 A /28-2.



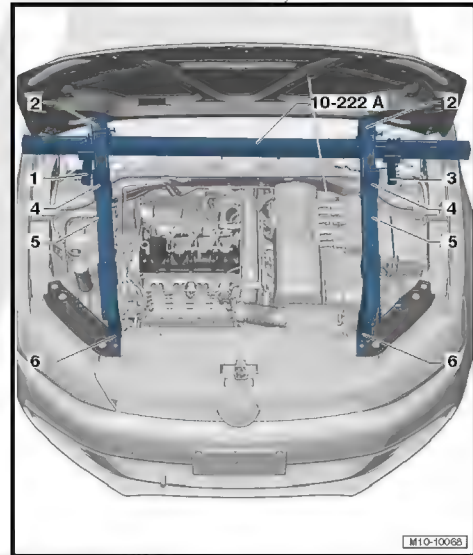
- Remove the bolts -arrows- for securing the engine support bridge on the lock carrier from the Engine Support Bridge - Engine Support 28-2 -10-222 A /28-2.
- Use the bolts from the Engine Support Bridge - Engine Support 28-2 -10-222 A /28-2- for attaching the Engine Support Bridge - Engine Support 28 -10 - 222 A /28-. Do not use the bolts for the retaining bracket.



- Tighten the fastening bolts -arrows- to 8 Nm.
- A second technician is needed to mount the Engine Support Bridge on the vehicle to prevent the Engine Support Bridge from tipping.

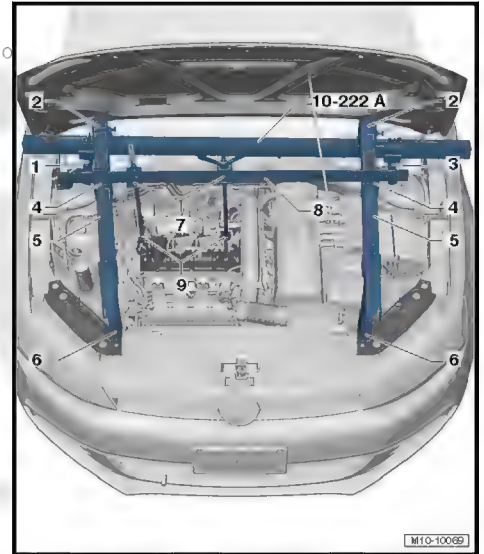


Mount the engine support bridge as follows to support the engine/transmission assembly:

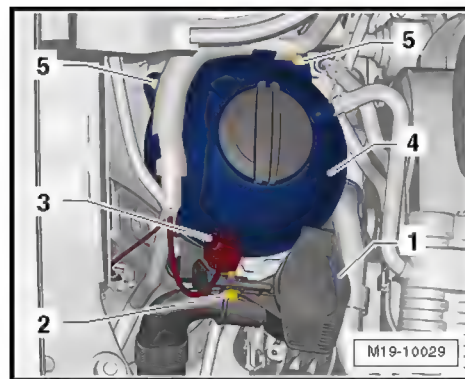


- 1 - Engine Support Bridge - Engine Support 31 Adapter 31-2  
-10 - 222 A /31-2-
  - 2 - Engine Support - Basic Set - Movable Joint -T40091/3-
  - 3 - Engine Support Bridge - Engine Support 31 Adapter 31-1  
-10 - 222 A /31-1-
  - 4 - Engine Support - Supplement Kit - Movable Joint -  
T40093/4-
  - 5 - Engine Support - Basic Set - Square Pipe -T40091/1-
  - 6 - Engine Support Bridge - Engine Support 28 -10 - 222  
A /28- with Engine Support Bridge - Engine Support 28-2  
-10-222 A /28-2-
- First slide the Movable Joints -2- onto the Square Pipe of the Engine Support Bridge -10 - 222 A-.
  - The bolts for the Engine Support - Joint Fixture -T40091/3-  
-2- on the Engine Support Bridge -10-222 A- point in the direction of travel.
  - Mount the Engine Support Bridge -10-222 A- on the suspension strut towers and have a second technician hold it to prevent it from falling over.
  - Slide the Square Pipe -T40091/1- -5- on the left and right sides through the Engine Support Bridge - Engine Support 28 -10-222 A /28- -6- from the front and position the Movable Joints -T40093/4- -4- on each side.
  - Slide the Rail with Holes -T40091/2- -8- with the Mounts -T40093/5- -7- into the Movable Joints -T40093/4- -4-.

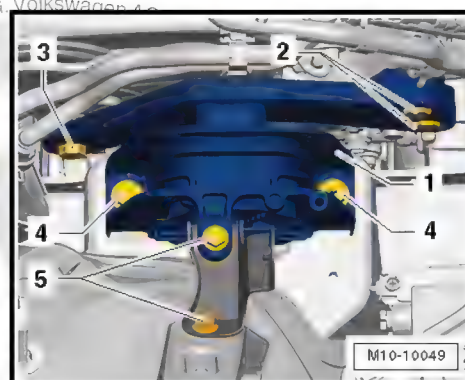




- 1 - Engine Support Bridge - Engine Support 31 Adapter 31-2 -10 - 222 A /31-2-
  - 2 - Engine Support - Basic Set - Movable Joint -T40091/3-
  - 3 - Engine Support Bridge - Engine Support 31 Adapter 31-1 -10 - 222 A /31-1-
  - 4 - Engine Support - Supplement Kit - Movable Joint - T40093/4-
  - 5 - Engine Support - Basic Set - Square Pipe -T40091/1-
  - 6 - Engine Support Bridge - Engine Support 28 -10 - 222 A /28- with Engine Support Bridge - Engine Support 28 -2 -10 -222 A /28-2-
  - 7 - Engine Support - Supplement Kit - Mount -T40093/5-
  - 8 - Engine Support - Basic Set - Rail with Holes -T40091/2-
  - 9 - Engine Support Bridge - Spindle -10 - 222 A /11-
- Insert the locking pins into the Rail with Holes -T40091/2- -8- and secure with cotter pins.
  - Tighten all threaded connections on the Engine Support Bridge hand-tight. While doing so, adjust the height of the Engine Support Bridge parallel over the Engine Support Bridge - Engine Support 28 -10 - 222 A /28-.
  - Lightly pretension the engine/transmission assembly via the Engine Support Bridge - Spindles -10 - 222 A /11- -9-, but do not lift.
  - Disconnect the connector -3- from the coolant reservoir sensor.
  - Remove the bolts -5- and place the coolant expansion tank -4- on top of the engine with the hoses connected.

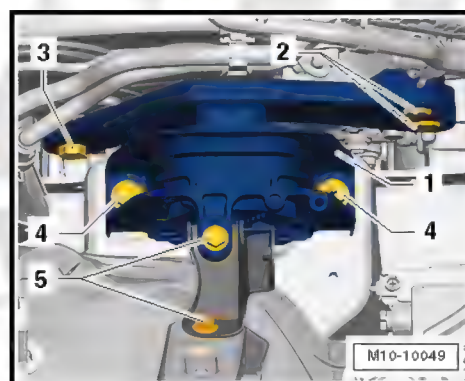


- Remove the bolt -2- and move the windshield washer fluid reservoir filler tube forward -1-.
- Loosen the bolts -5-.



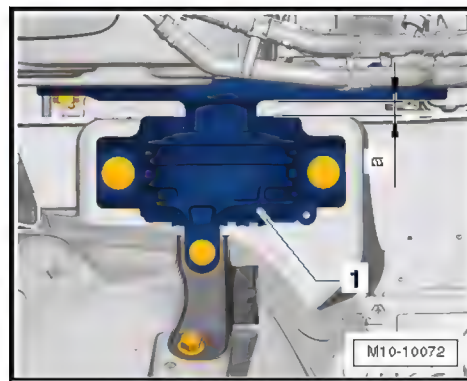
- Remove the bolt -3-. The bolt is accessible through the right wheel housing.
- Remove the bolts -2 and 4-.

#### Installing

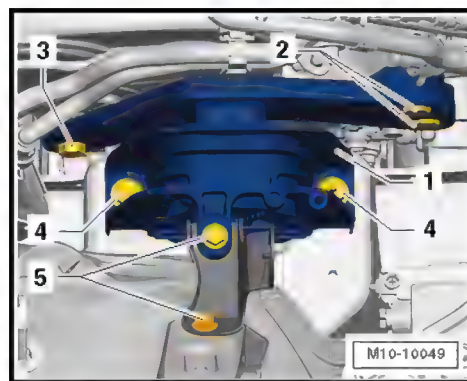


Install in the reverse order of removal while noting the following:

- Install all the engine mount bolts completely by hand.
- Tighten the bolts -2 and 3-. The bolt -3- is accessible through the right wheel housing.
- Align the engine mount -1- so that the distance -a- is the same.



- Tighten the bolts -4-.



- Tighten the bolts -5-.
- Remove the Engine Support Bridge -10 - 222 A- from the engine.
- Replace the bolts that were tightened with an additional turn.

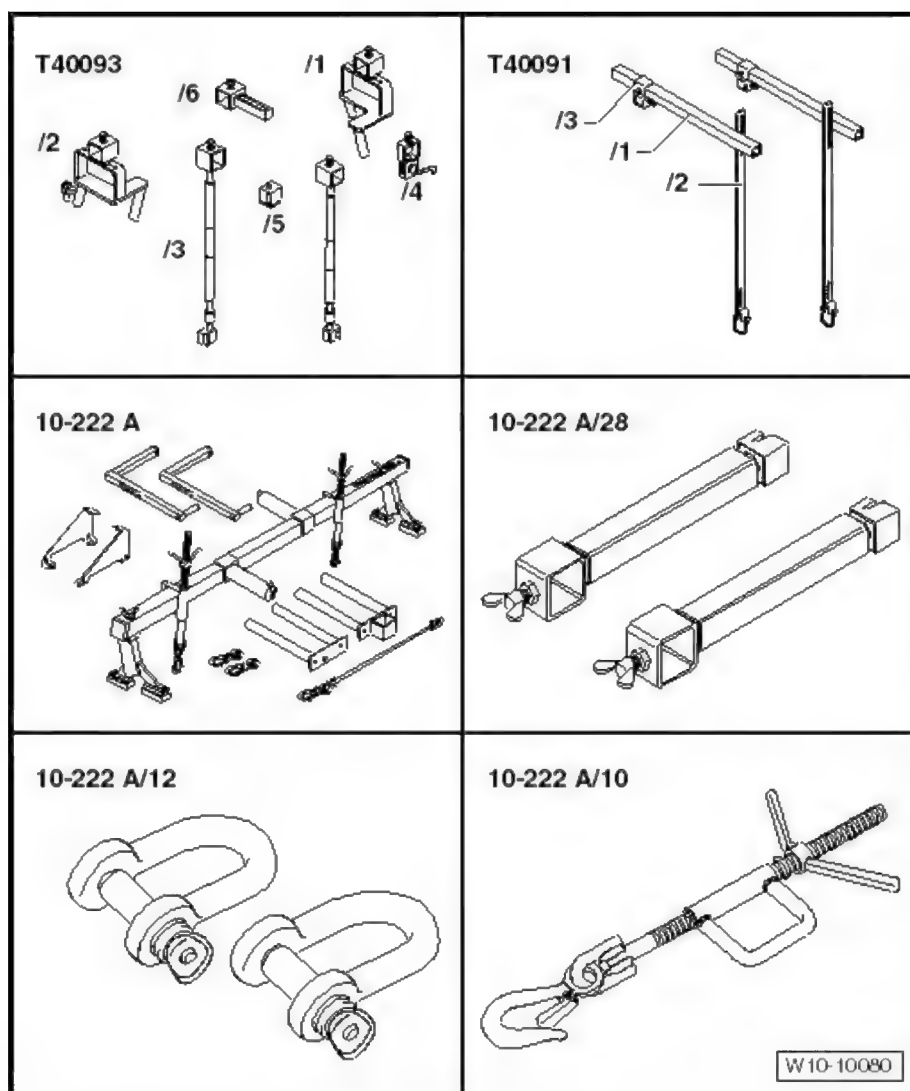
#### Tightening Specifications

- ◆ Refer to ➔ [-2.1 Assembly Mounts-, page 71](#)

### 2.5.2 Subframe Mount, Adjusting, Transmission Mount



Special tools and workshop  
equipment required



- ◆ Engine Support Bridge -10 - 222 A-
- ◆ Engine Support - Automatic Transmission Hook -10 - 222 A /7-
- ◆ Engine Support - Bracket w/Spindle and Hook -10 - 222 A /10-
- ◆ Engine Support Bridge - Engine Support 28 -10 - 222 A /28-
- ◆ Engine Support Bridge - Engine Support 31 -10 - 222 A /31-
- ◆ Engine Support - Basic Set - Rail with Holes -T40091/2-
- ◆ Engine Support - Basic Set -T40091-
- ◆ Engine Support - Supplement Kit Mount 5 -T40093/5- from the Engine Support - Supplement Kit -T40093A-
- ◆ Engine Support Bridge - Engine Support 28-2 -10 - 222 A / 28-2- (quantity 2)
- ◆ Square Pipe -T40091/1- (quantity 2) from the Engine Support - Basic Set -T40091-
- ◆ Movable Joint -T40091/3- (quantity 2) from the Engine Support - Basic Set -T40091-

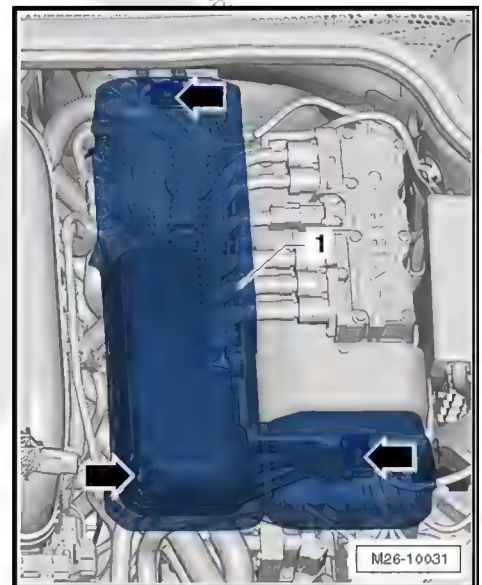




- ◆ Movable Joint -T40093/4- (quantity 2) from the Engine Support - Supplement Kit -T40091-
- ◆ Torque Wrench 1331 5-50Nm -V.A.G 1331-

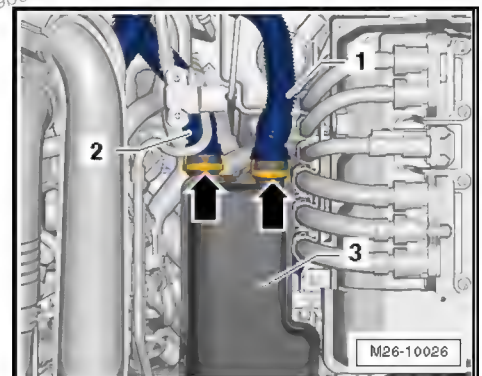


## Removing

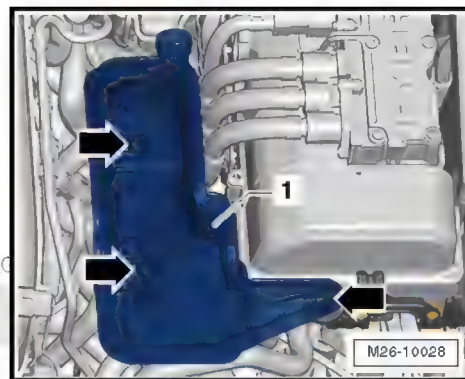


- Unclip and remove the damper cover -1- upward from the retainers -arrows-.

## Vehicles with Secondary Air System



- Disconnect the air line -1 and 2- from the damper -3-. To do so, press the locking rings -arrows- together on both sides and disconnect the lines.
- Remove the damper -1- upward from the rubber bushings -arrows-.



#### Continuation for All Vehicles

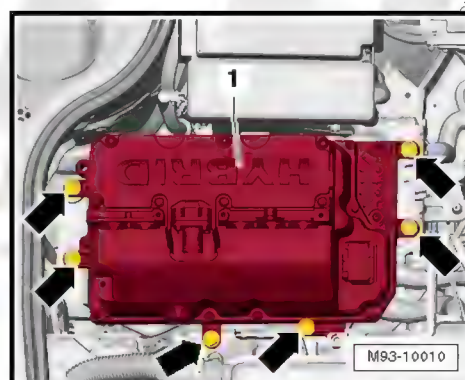
#### DANGER

Extremely dangerous due to high-voltage.

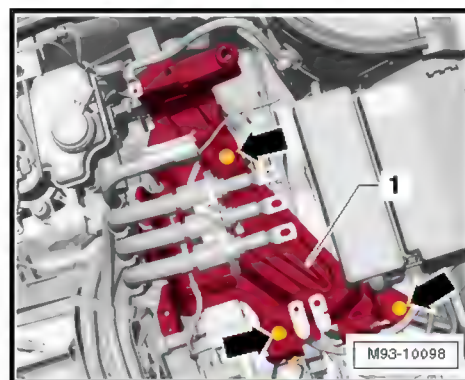
Electrocution can cause death or very serious personal injury.

- Have the high-voltage system de-energized by a qualified person.

- Disable the high-voltage system. Refer to ➔ Electrical Equipment; Rep. Gr. 93; High-Voltage System, Disabling.
- Remove the Electric Drive Power and Control Electronics -JX1-. Refer to ➔ Electrical Equipment; Rep. Gr. 93; Electric Drive Power and Control Electronics; Electric Drive Power and Control Electronics, Removing and Installing.

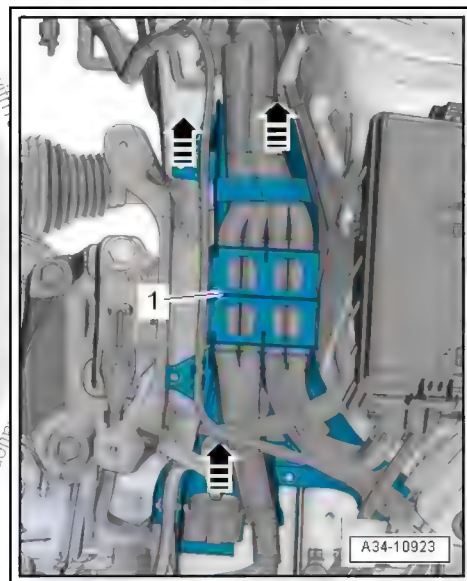


- Remove the Electric Drive Power and Control Electronics -JX1- bracket. Refer to ➔ Electrical Equipment; Rep. Gr. 93; Electric Drive Power and Control Electronics; Electric Drive Power and Control Electronics, Removing and Installing.

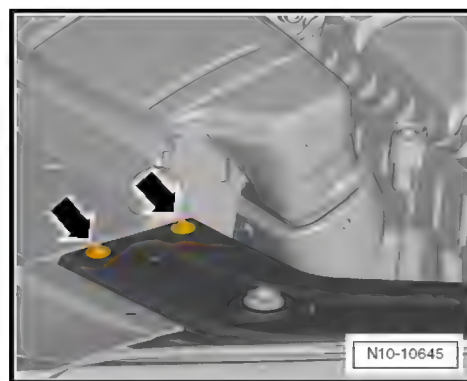




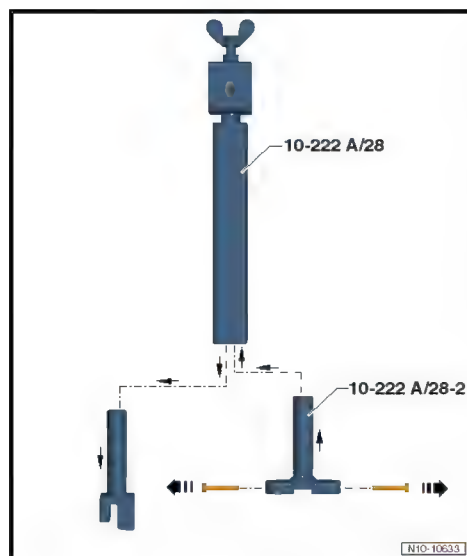
- Unclip the wiring guide -1- upward in direction of -arrows- and move it slightly to the side.



- Remove the bolts -arrows- for the lock carrier retaining bracket on the left and right sides

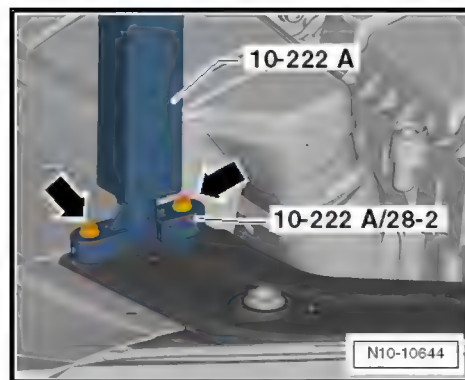


- Remove the lower mounts on the Engine Support Bridge - Engine Support 28 -10 - 222 A /28- and replace with the Engine Support Bridge - Engine Support 28-2 -10 - 222 A / 28-2-.



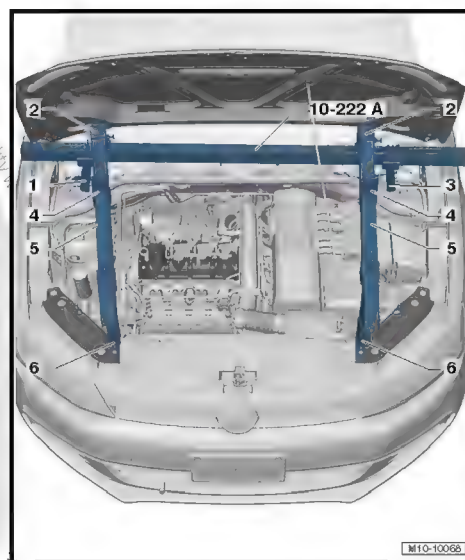


- Remove the bolts -arrows- for securing the engine support bridge on the lock carrier from the Engine Support 28-2 -10-222 A /28-2-.
- Use the bolts from the Engine Support Bridge - Engine Support 28-2 -10-222 A /28-2- for attaching the Engine Support Bridge - Engine Support 28 -10 - 222 A /28-. Do not use the bolts for the retaining bracket since they are too short.
- Install the Engine Support Bridge - Engine Support 28 -10 - 222 A /28- and tighten the bolts -arrows-.



- Bolt tightening specification -arrows- 8 Nm
- A second technician is needed to mount the Engine Support Bridge on the vehicle to prevent the Engine Support Bridge from tipping.

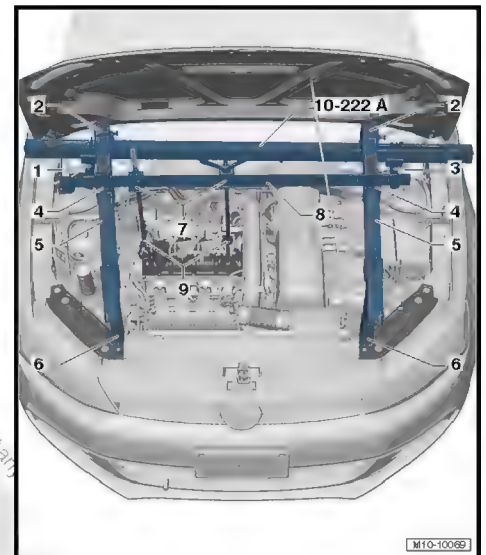
Mount the engine support bridge as follows to support the engine/transmission assembly:



- 1 - Engine Support Bridge - Engine Support 31 Adapter 31-2 -10 - 222 A /31-2-
- 2 - Engine Support - Basic Set - Movable Joint -T40091/3-
- 3 - Engine Support Bridge - Engine Support 31 Adapter 31-1 -10 - 222 A /31-1-
- 4 - Engine Support - Supplement Kit - Movable Joint - T40093/4-
- 5 - Engine Support - Basic Set - Square Pipe -T40091/1-



- 6 - Engine Support Bridge - Engine Support 28 -10 - 222 A /28- with Engine Support Bridge - Engine Support 28-2 -10-222 A /28-2-
- First slide the Movable Joints -2- onto the Square Pipe of the Engine Support Bridge -10 - 222 A-.
- The bolts for the Engine Support - Joint Fixture -T40091/3- -2- on the Engine Support Bridge -10-222 A- point in the direction of travel.
- Mount the Engine Support Bridge -10-222 A- on the suspension strut towers and have a second technician hold it to prevent it from falling over.
- Slide the Square Pipe -T40091/1- -5- on the left and right sides through the Engine Support Bridge - Engine Support 28 -10-222 A /28- -6- from the front and position the Movable Joints -T40093/4- -4- on each side.
- Slide the Rail with Holes -T40091/2- -8- with the Mounts -T40093/5- -7- into the Movable Joints -T40093/4- -4-.

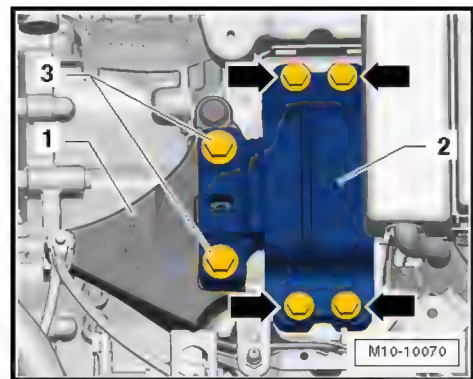


- 1 - Engine Support Bridge - Engine Support 31 Adapter 31-2 -10 - 222 A /31-2-
- 2 - Engine Support - Basic Set - Movable Joint -T40091/3-
- 3 - Engine Support Bridge - Engine Support 31 Adapter 31-1 -10 - 222 A /31-1-
- 4 - Engine Support - Supplement Kit - Movable Joint -T40093/4-
- 5 - Engine Support - Basic Set - Square Pipe -T40091/1-
- 6 - Engine Support Bridge - Engine Support 28 -10 - 222 A /28- with Engine Support Bridge - Engine Support 28-2 -10-222 A /28-2-
- 7 - Engine Support - Supplement Kit - Mount -T40093/5-
- 8 - Engine Support - Basic Set - Rail with Holes -T40091/2-
- 9 - Engine Support Bridge - Spindle -10 - 222 A /11-
- Insert the locking pins into the Rail with Holes -T40091/2- -8- and secure with cotter pins.
- Tighten all threaded connections on the Engine Support Bridge hand-tight. While doing so, adjust the height of the

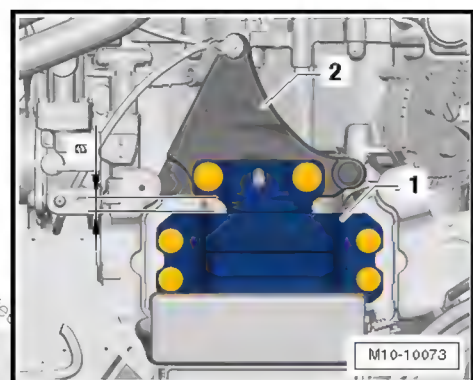


Engine Support Bridge parallel over the Engine Support Bridge - Engine Support 28 -10 - 222 A /28-.

- Lightly pretension the engine/transmission assembly via the Engine Support Bridge - Spindles -10 - 222 A /11- -9-, but do not lift.
- Replace the assembly mount bolts -arrows- one after the other (if not already done) and tighten them by hand.



- Align the transmission mount -1- with the transmission bracket -2- so that the distance -a- is the same.



- Remove the Engine Support Bridge -10 - 222 A- from the engine.

#### Tightening Specifications

- ◆ Refer to ➤ [-2.1 Assembly Mounts", page 71](#)

## 2.6 Assembly Mount, Checking Adjustment



#### Note

- ◆ *For all repair work, especially in the engine compartment due to the tight working conditions, observe the following:*
- ◆ *Route all wires and lines so that the original path is followed.*
- ◆ *Make sure that there is sufficient clearance to all moving or hot components.*



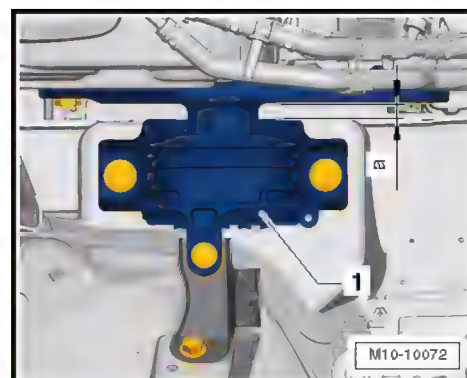
#### Note

*The assembly mount bolts may only be loosened when the engine is supported with the Engine Support Bridge -10-222 A-.*



- Support the engine in the installation position. Refer to ➤ [M2.2 ount, Removing and Installing", page 74](#) .

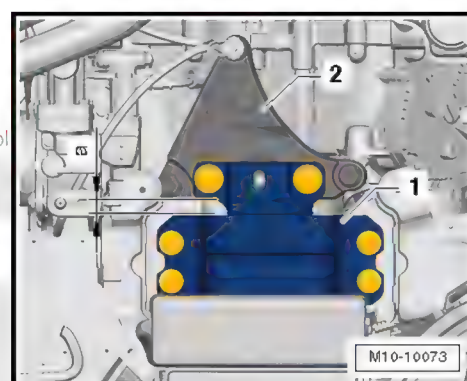
### Engine Mount



The following specifications must be achieved:

- Distance -a- = must be the same and must be at least 10 mm.
- Adjust the subframe mount if the distance is uneven, too small or too big when measured. Refer to ➤ [M2.5 ount, Adjusting", page 90](#) .

### Transmission Mount



The following dimensions must be attained:

- Distance -a- = must be the same and must be at least 10 mm.
- Adjust the subframe mount if the distance is uneven, too small or too big when measured. Refer to ➤ [M2.5 ount, Adjusting", page 90](#) .



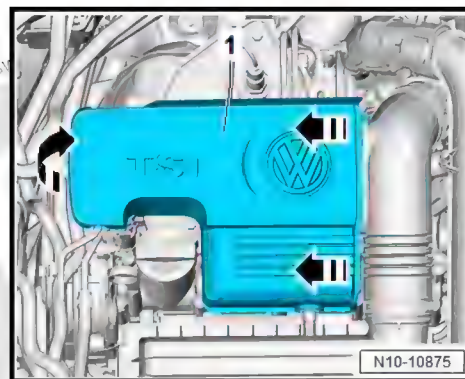
### 3 Engine Cover

⇒ C3.1 over, "Removing and Installing", page 106

#### 3.1 Engine Cover, Removing and Installing

##### Removing

- Remove the engine cover -1- in direction of the arrow  
-Right arrow- from the retaining pin.



- Remove the engine cover -1- in direction of the arrow  
-Left arrows- from the guides.

##### Installing

- To prevent damage to the engine cover, do not hit it with a fist or a tool.
- Pay attention to the oil filler tube when positioning the engine cover.







## 13 – Crankshaft, Cylinder Block

### 1 Cylinder Block, Belt Pulley Side

⇒ [-1.1 Belt Pulley Side Sealing Flange", page 107](#)

⇒ [D1.2 amper, Removing and Installing", page 109](#)

⇒ [B1.3 racket, Removing and Installing", page 111](#)

⇒ [S1.4 eal, Replacing, Belt Pulley Side", page 112](#)

⇒ [F1.5 lange, Removing and Installing, Belt Pulley Side", page 115](#)

#### 1.1 Overview - Belt Pulley Side Sealing Flange





**1 - Bolt**

- ☐ 150 Nm +180°
- ☐ Replace after removing

**2 - Vibration Damper**

- ☐ Removing and Installing. Refer to ➤ [D1.2 amper, Removing and Installing", page 109](#).

**3 - Seal**

- ☐ Replace after removing. Refer to ➤ [S1.4 eal, Replacing, Belt Pulley Side", page 112](#).
- ☐ For the vibration damper crankshaft
- ☐ Do not oil

**4 - Sealing Flange, Belt Pulley Side**

- ☐ Must be seated on the alignment pins
- ☐ Removing and Installing. Refer to ➤ [F1.5 lange, Removing and Installing, Belt Pulley Side", page 115](#).

**5 - Bolt**

- ☐ Replace after removing
- ☐ Tightening specification and sequence. Refer to ➤ [Fig. ""Ribbed Belt Pulley Side Sealing Flange - Tightening Specifications and Sequence""", page 108](#).

- ☐ There are different thread diameters. Refer to the ➤ [Electronic Parts Catalog \(ETKA\)](#)

**6 - Seal**

- ☐ Replace after removing

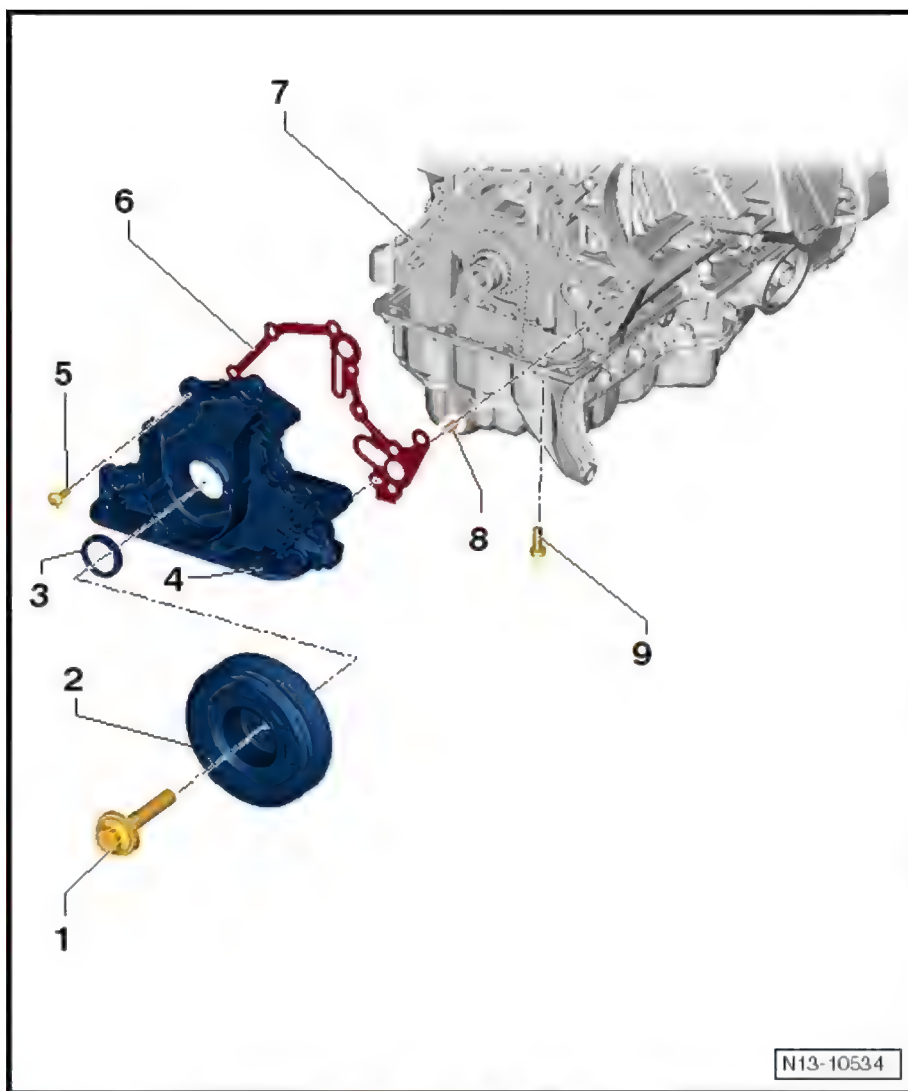
**7 - Cylinder Block**

**8 - Alignment Pin**

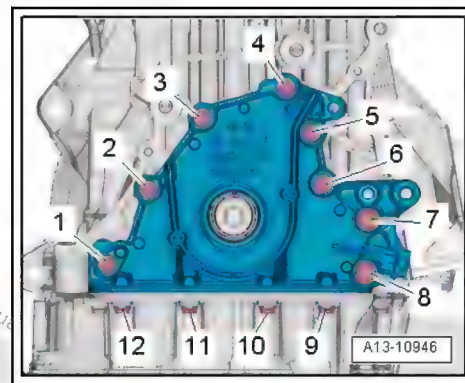
- ☐ Quantity: 2

**9 - Bolt**

- ☐ Tightening specification and sequence. Refer to ➤ [Fig. ""Ribbed Belt Pulley Side Sealing Flange - Tightening Specifications and Sequence""", page 108](#).
- ☐ Replace after removing



**Ribbed Belt Pulley Side Sealing Flange - Tightening Specifications and Sequence**



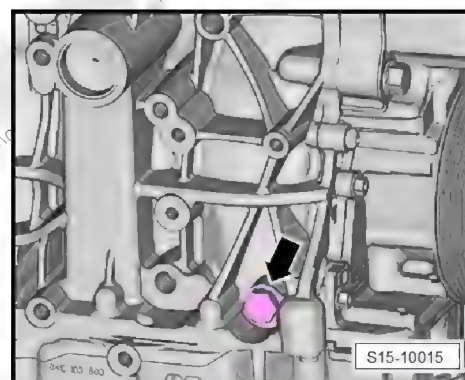
### Note

Replace the bolts that were tightened with an additional turn.

– Tighten the bolts in steps:

Step	Component	Tightening Specification/Additional Turn
1	Bolts -1 to 12-	Install all the way by hand
2	Bolts -1 to 12-	Diagonally to 8 Nm
3	Bolts -7 and 8-	20 Nm
4	Bolts -1 to 12-	In a diagonal sequence 90° additional turn

Bolt for the “TDC” Hole in the Rear Cylinder Block - Tightening Specification



### Note

- ◆ Plug with integrated seal -arrow-.
- ◆ Replace if damaged.

Component	Tightening Specification
Bolt -arrow-	30 Nm

## 1.2 Vibration Damper, Removing and Installing

Special tools and workshop equipment required

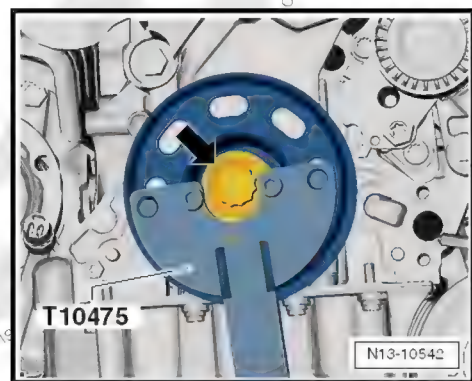


◆ Counterhold - Pulley -T10475-



Removing

- Remove the noise insulation. Refer to ➔ Body Exterior; Rep. Gr. 66; Noise Insulation; Noise Insulation, Removing and Installing.
- Position the engine in the “TDC position for cylinder 1”. Refer to ➔ [page 124](#).
- Loosen the bolt -arrow- for the vibration damper by using the Counterhold - Pulley -T10475-.



- Remove the bolt and the vibration damper.



NOTICE

Risk of destroying the engine by adjusting the valve timing.

- Do not turn the crankshaft out of TDC.

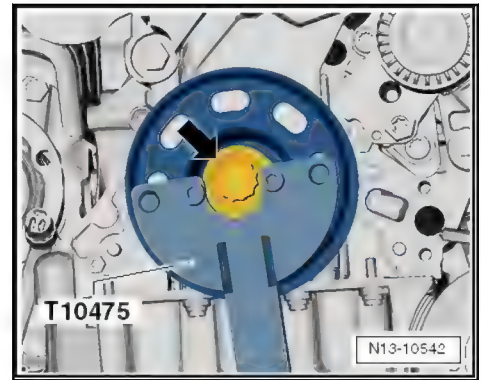
Installing



Note

- ◆ *Replace the bolts that were tightened with an additional turn.*
- ◆ *All surfaces between the bolt, vibration damper and crankshaft toothed belt sprocket must not have any oil or grease on them.*
- Install the vibration damper and install the vibration damper bolt, with an oiled thread, all the way in by hand.





- Tighten the bolt -arrow- for the vibration damper by using the Counterhold - Pulley -T10475-.

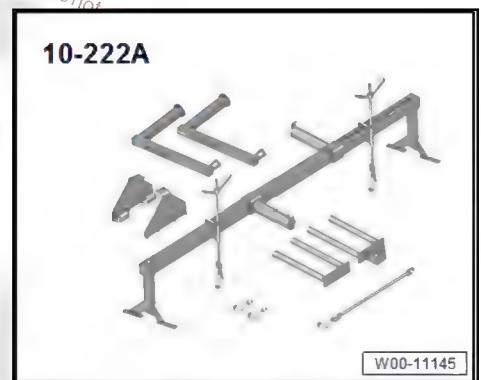
#### Tightening Specifications

- ◆ Refer to ⇒ [-1.1 Belt Pulley Side Sealing Flange”, page 107](#)

### 1.3 Engine Bracket, Removing and Installing

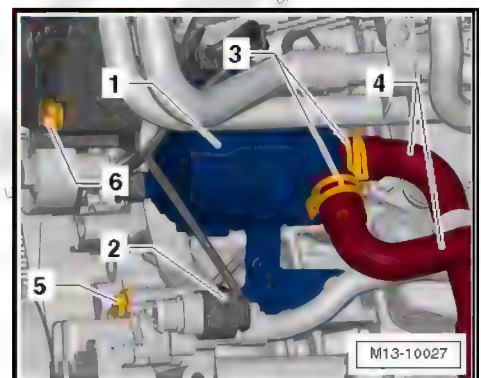
#### Special tools and workshop equipment required

- ◆ Engine Support Bridge -10 - 222 A-

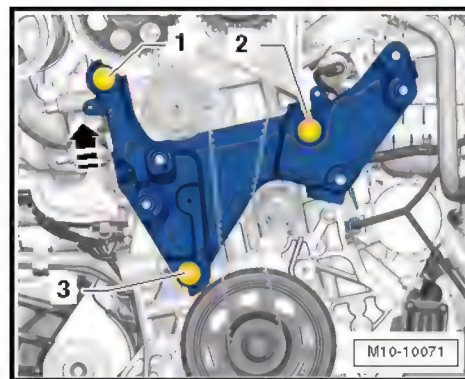


#### Removing

- Remove the engine mount. Refer to ⇒ [M2.2 ount, Removing and Installing”, page 74](#) .
- Remove the toothed belt. Refer to ⇒ [B2.4 elt, Removing and Installing”, page 169](#) .
- Remove the bolt -6- from the coolant pump bracket.



- Remove the bolts -1 through 3- and the engine mount bracket.



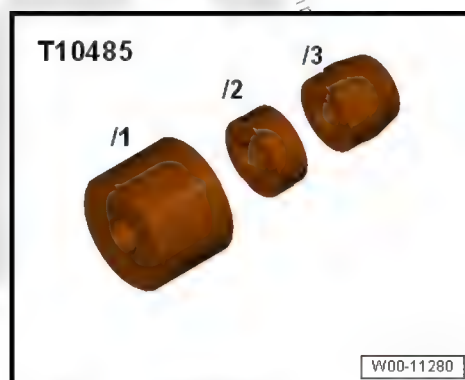
### Tightening Specifications

- ◆ Refer to ➤ [-2.1 Assembly Mounts](#), page 71
- ◆ Refer to ➤ [-2.1 Toothed Belt Guard](#), page 165
- ◆ Refer to ➤ [-3.1 Coolant Pipes](#), page 316

## 1.4 Crankshaft Seal, Replacing, Belt Pulley Side

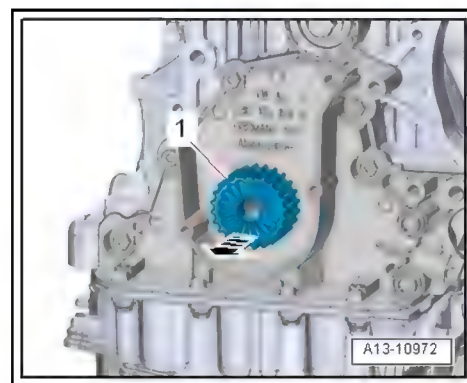
### Special tools and workshop equipment required

- ◆ Seal Installer - Camshaft -T10485-
- ◆ Puller - Crankshaft/Power Steering Seal -T20143-





## Procedure



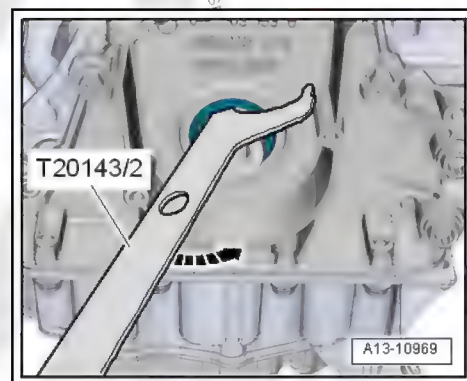
- Remove the toothed belt. Refer to ➔ [B2.4 elt, Removing and Installing](#), page 169 .
- Remove the crankshaft toothed belt sprocket -1- in direction of -arrow-.



### NOTICE

**Risk of destroying the engine by adjusting the valve timing.**

- Do not turn the crankshaft out of TDC.
- Pry out the seal using the Puller - Crankshaft/Power Steering Seal -T20143/2- -arrow-.



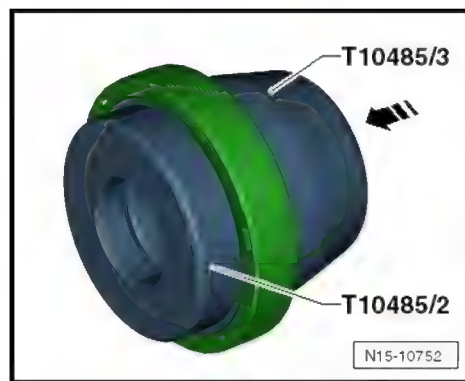
- Clean the contact and sealing surface.



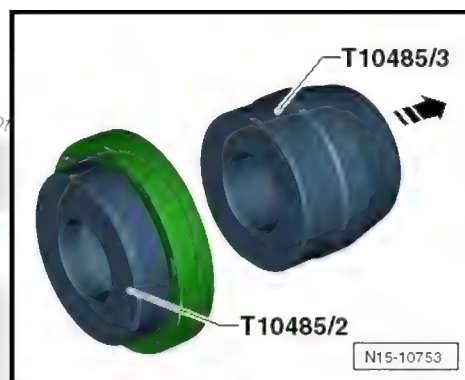
### Note

*Do not coat the new seal with oil.*

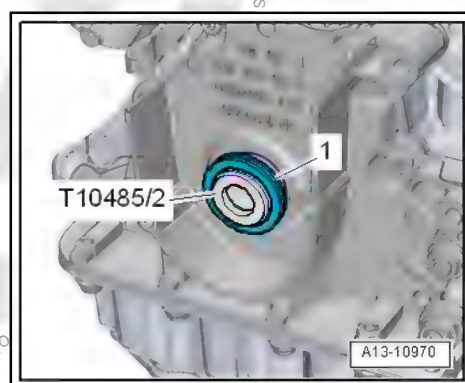
- Slide the new seal onto the Guide Sleeve -T10485/2- in the direction of -arrow-.



- Remove the Guide Sleeve -T10485/3- in the direction of -arrow-.

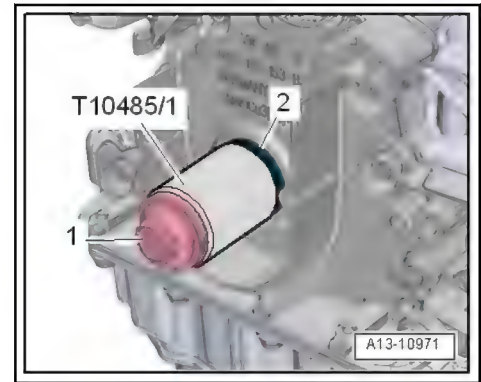


- Installed position: the closed side of the seal faces the seal installer.
- Separate the fitting sleeve and guide sleeve.
- Mount the Guide Sleeve -T10485/2- with the seal -1- on the crankshaft.

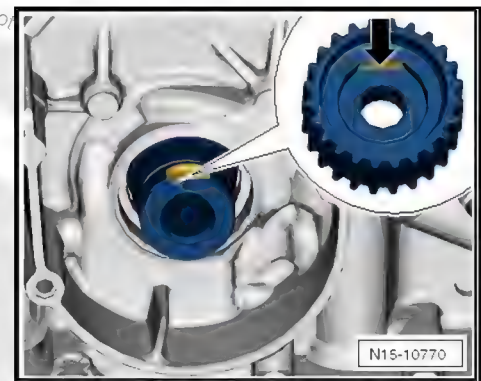


- Install the seal -2- with the Thrust Piece -T10485/1- and the bolt -1- for the belt pulley all the way.





- Mount the crankshaft toothed belt sprocket on the crankshaft.



- The contact surface between the vibration damper and the crankshaft toothed belt sprocket must not have any oil or grease on it.
- The milled surface -arrow- on the crankshaft toothed belt sprocket must fit on the milled surface on the crankcase pin.
- Install the toothed belt (adjust valve timing). Refer to ➤ [B2.4 elt, Removing and Installing", page 169](#).

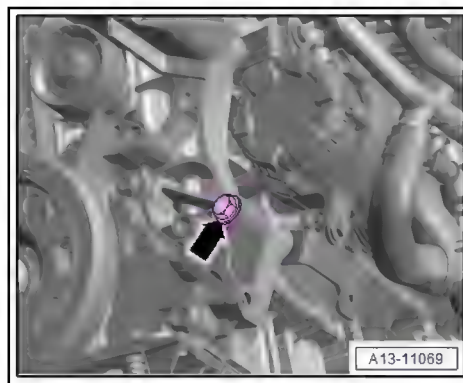
## 1.5 Sealing Flange, Removing and Installing, Belt Pulley Side

### Special tools and workshop equipment required

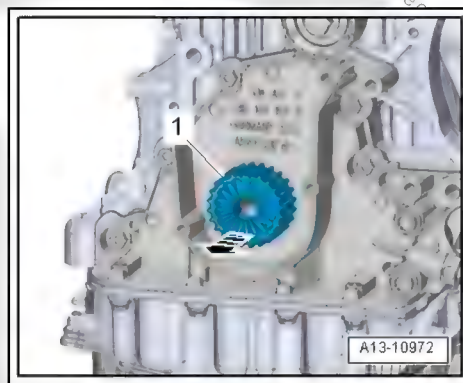
- ◆ Flat-Blade Scraper
- ◆ Refer to the ➤ Electronic Parts Catalog (ETKA) for the correct sealant.

### Removing

- Remove the A/C compressor from the bracket and tie it up. Refer to ➤ Heating, Ventilation and Air Conditioning; Rep. Gr. 87; A/C Compressor; A/C Compressor, Removing and Installing on Bracket.
- Remove the toothed belt. Refer to ➤ [B2.4 elt, Removing and Installing", page 169](#).



- Remove the bolt -arrow- on the bracket for the Low Temperature Circuit Coolant Pump -V468-.

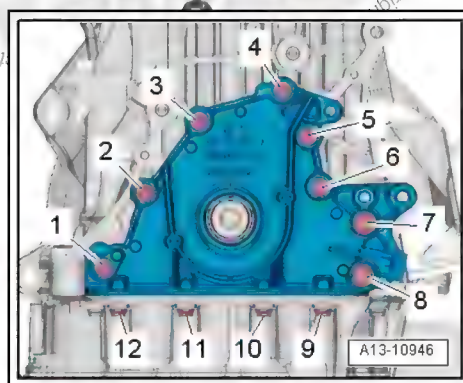


- Remove the crankshaft toothed belt sprocket -1- in direction of -arrow-.



**Risk of destroying the engine by adjusting the valve timing.**

- Do not turn the crankshaft out of TDC.
- Remove the bolts -1 through 12- and carefully loosen the sealing flange from the bonding.



- Remove the shaft seal when the sealing flange is removed.

### Installing

Install in the reverse order of removal while noting the following:

- Risk of contaminating the lubrication system with sealant residue.
- Lay a clean cloth over the open section of the oil pan.

- Remove any sealant residue on the sealing flange and on the oil pan upper section.
- Clean any oil or grease off the sealing surfaces.

### ⚠ CAUTION

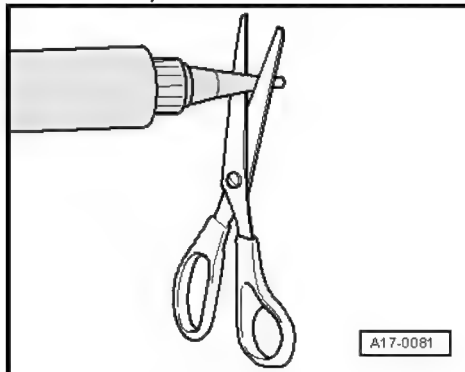
Risk of injuring the eyes from sealant residue.

- Wear protective eyewear.

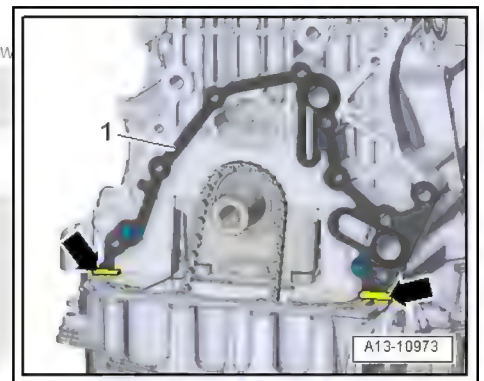


### Note

*Be sure to check the expiration date of the sealant.*

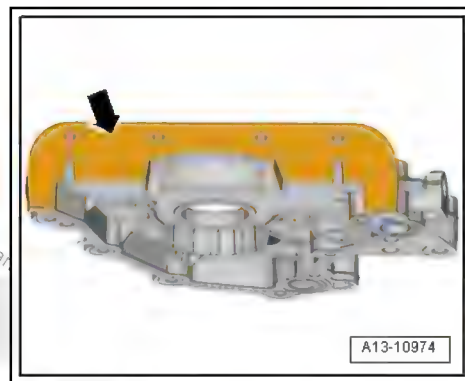


- Cut the tube nozzle at the front marking (nozzle diameter: about 2 mm).
- Mount the gasket -1- on the alignment pins on the cylinder block.



- Apply a thin bead of sealant -arrows- on edge between cylinder block and oil pan.
- Lightly coat the lower sealing surface -arrow- on the sealing flange with sealant.

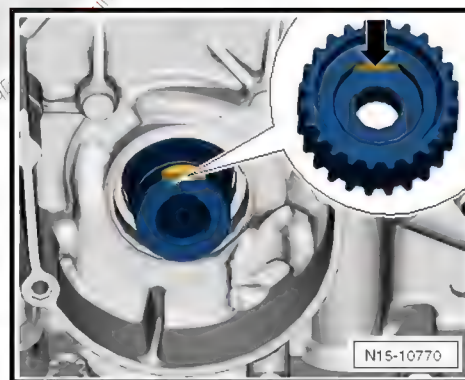




#### Note

*Install the sealing flange within five minutes of applying the sealant.*

- Carefully push the sealing flange onto the alignment pins on the cylinder block.
- Tighten the sealing flange bolts. Refer to ➤ [Fig. ““Ribbed Belt Pulley Side Sealing Flange - Tightening Specifications and Sequence””, page 108](#) .
- Install the crankshaft shaft seal on the belt pulley side. Refer to ➤ [S1.4 Seal, Replacing, Belt Pulley Side”, page 112](#) .
- Mount the crankshaft toothed belt sprocket on the crankshaft.



- The contact surface between the ribbed belt pulley and the crankshaft toothed belt sprocket must not have any oil or grease on it.
- The milled surface -arrow- on the crankshaft toothed belt sprocket must fit on the milled surface on the crankcase pin.
- Install the toothed belt (adjust valve timing). Refer to ➤ [-2.2 Toothed Belt”, page 165](#) .

#### Tightening Specifications

- ◆ Refer to ➤ [Fig. ““Ribbed Belt Pulley Side Sealing Flange - Tightening Specifications and Sequence””, page 108](#)
- ◆ Overview - Generator. Refer to ➤ Electrical Equipment; Rep. Gr. 27; Generator; Overview - Generator.
- ◆ Refer to ➤ [-2.2 Electric Coolant Pump”, page 290](#)





## 2 Cylinder Block, Transmission Side

⇒ [-2.1 Cylinder Block, Transmission Side", page 119](#)

⇒ [F2.2 lange, Removing and Installing, Transmission Side", page 122](#)

### 2.1 Overview - Cylinder Block, Transmission Side





## 1 - Engine

### 2 - Openings

- ❑ One for the Electric Drive Motor -V141- decoupler with 6 mm inner diameter. Refer to the ➤ [Electronic Parts Catalog \(ETKA\)](#).
- ❑ Two for the Electric Drive Motor -V141- cooling system with 8 mm inner diameter. Refer to the ➤ [Electronic Parts Catalog \(ETKA\)](#).
- ❑ Replace after removing the Electric Drive Motor -V141-. Refer to ➤ [E1.5.2 Electric Drive Motor V141, Attaching to Engine, Reinstalling Electric Drive Motor V141](#), page 54.

### 3 - Crankshaft Plugs

- ❑ 10 Nm
- ❑ Replace after removing. Refer to the ➤ [Electronic Parts Catalog \(ETKA\)](#).

### 4 - Sealing Flange with Sensor Wheel and Seal

- ❑ Sealing flange, seal and sensor wheel, replacing. Refer to ➤ [F2.2 Range, Removing and Installing, Transmission Side](#), page 122.

- ❑ Removing and Installing. Refer to ➤ [F2.2 Range, Removing and Installing, Transmission Side](#), page 122.

### 5 - Bolt

- ❑ Sealing flange to engine
- ❑ Tightening specification and sequence. Refer to ➤ [Fig. "Transmission Side Sealing Flange - Tightening Specifications and Sequence"](#), page 122.

### 6 - Bolt

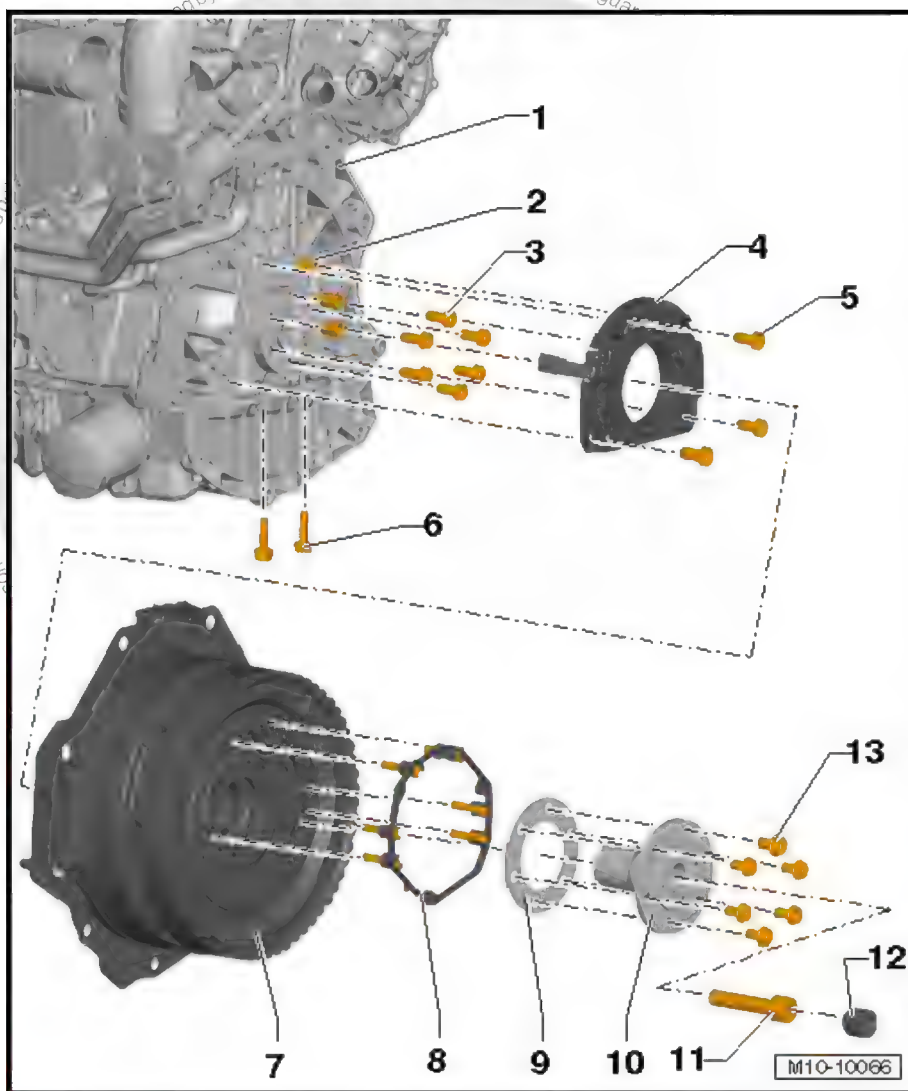
- ❑ Oil pan to sealing flange
- ❑ Tightening specification and sequence. Refer to ➤ [Fig. "Transmission Side Sealing Flange - Tightening Specifications and Sequence"](#), page 122.

### 7 - Electric Drive Motor -V141-

- ❑ Electric Drive Motor -V141-, separating from engine. Refer to ➤ [D1.3 Drive Motor V141, Separating from Engine](#), page 29.
- ❑ Electric Drive Motor -V141-, attaching to engine. Refer to ➤ [E1.5 Electric Drive Motor V141, Attaching to Engine](#), page 41.

### 8 - Bolts

- ❑ 18 Nm +30°
- ❑ Bolts can be reused
- ❑ Electric Drive Motor -V141- to engine





- ☐ Held secure in the Electric Drive Motor -V141- by a plastic retainer
- ☐ Follow the tightening specification. Refer to ⇒ [E1.5 lectric Drive MotorV141, Attaching to Engine", page 41](#) .

#### 9 - Shims

- ☐ There are different thicknesses. Refer to the ⇒ [Electronic Parts Catalog \(ETKA\)](#).
- ☐ It is necessary to select the correct shim. Refer to ⇒ [E1.5.1 lectric Drive MotorV141, Attaching to Engine, New Electric Drive MotorV141", page 41](#) .

#### 10 - Flange

- ☐ To the crankshaft

#### 11 - Central Bolt

- ☐ 180 Nm +180°



#### Note

- ◆ *The central bolt has a left-hand thread.*
- ◆ *The head must be turn by the torque wrench (check the function before tightening the bolt).*
- ◆ *The engine must be bolted to the scissor-type assembly platform when loosening and tightening the central bolts. Refer to ⇒ [D1.3 rive MotorV141, Separating from Engine", page 29](#) .*

- ☐ Turn the head of the torque wrench (left-hand thread)
- ☐ Check the torque wrench function at a suitable location.
- ☐ The correct shim must be selected first before tightening when installing a new Electric Drive Motor -V141-. Refer to ⇒ [E1.5.1 lectric Drive MotorV141, Attaching to Engine, New Electric Drive MotorV141", page 41](#) .
- ☐ Replace after removing. Refer to the ⇒ [Electronic Parts Catalog \(ETKA\)](#).

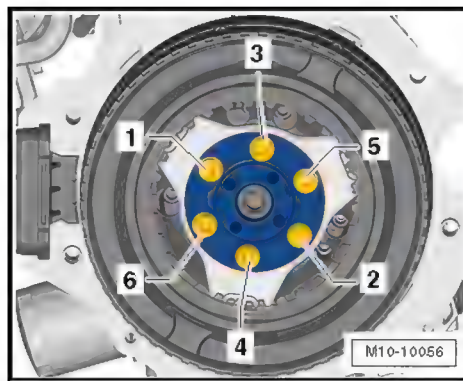
#### 12 - Needle Bearing

- ☐ Removing and Installing. Refer to ⇒ [D1.3 rive MotorV141, Separating from Engine", page 29](#) .
- ☐ Replace after removing. Refer to the ⇒ [Electronic Parts Catalog \(ETKA\)](#).

#### 13 - Bolt

- ☐ Flange to Electric Drive Motor -V141-
- ☐ Replace after removing. Refer to the ⇒ [Electronic Parts Catalog \(ETKA\)](#).
- ☐ Tightening specification and sequence. Refer to ⇒ [Fig. "Crankshaft Flange to Drive Motor - Tightening Specification and Sequence", page 121](#) .

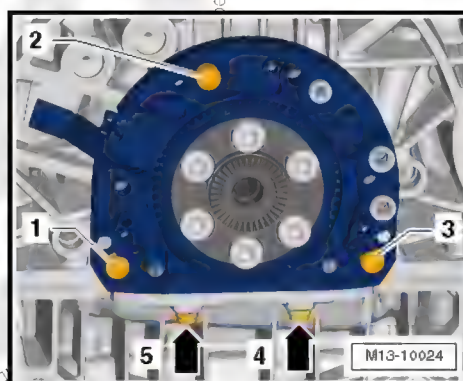
#### Crankshaft Flange to Drive Motor - Tightening Specification and Sequence



- Tighten the bolts in the sequence -1 through 6-:

Step	Component	Tightening Specification
1	Bolts -1 through 6-	Install all the way by hand
2	Bolts -1 through 6-	Tighten to 60 Nm
3	Bolts -1 through 6-	Turn an additional 90°

#### Transmission Side Sealing Flange - Tightening Specifications and Sequence



- Tighten the bolts in the sequence -1 through 5-:

Step	Component	Tightening Specification
1	Bolts -1 through 5-	Install all the way by hand
2	Bolts -1 through 5-	Tighten to 10 Nm

## 2.2 Sealing Flange, Removing and Installing, Transmission Side

Special tools and workshop equipment required





- ◆ Torque Wrench 1332 Insert - Open Ring Wrench - 24mm  
-V.A.G 1332/11-



- ◆ Depth Gauge -VAS 6082-



- ◆ Seal Installer - Rear Crankshaft -T10134-



- ◆ Crankshaft Locking Pin -T10340-



- ◆ M 6 x 35 Bolts (quantity: 3)

#### Procedure

- Electric Drive Motor -V141- is removed. Refer to [⇒ D1.3 rive MotorV141, Separating from Engine](#), page 29 .



#### Note

*The engine is not shown in the following illustrations.*

#### Crankshaft at "TDC", Positioning

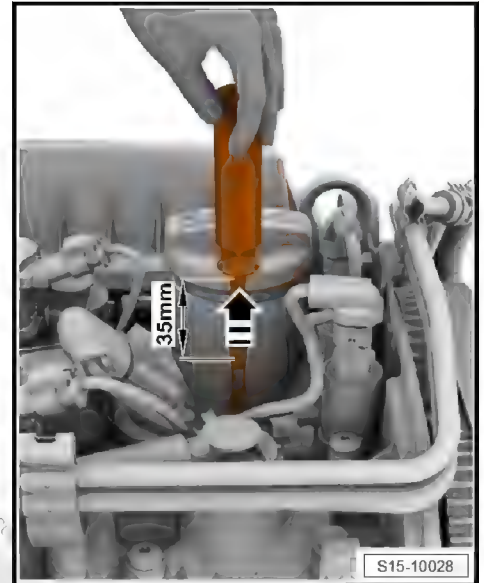
- Remove the ignition coils with power output stages cylinder 1. Refer to ➤ **C1.3 oils with Power Output Stages, Removing and Installing**, page 431 .
- Remove the cylinder 1 spark plug.

Adjusting the position of the crankshaft by installing the bolt:

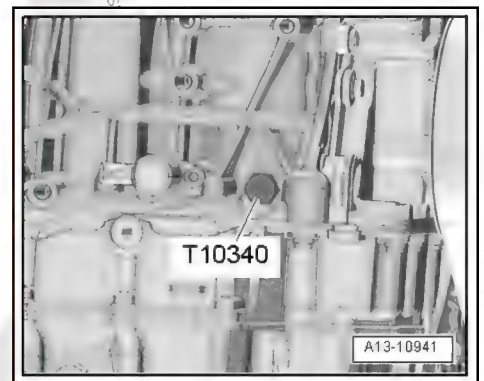
- Insert a screwdriver carefully in the spark plug opening in the direction of -arrow -, length of the shaft minimum 250 mm, so that the it contacts the piston crown.



- Turn the crankshaft in the direction of engine rotation to "BDC" for cylinder 1.
- Turn the crankshaft in the direction of engine rotation again, so that the screwdriver in the direction of -arrow- is pushed upward and out 35 mm.



- Remove the plug for the “TDC” hole in the cylinder block. Refer to ➤ Fig. [“Bolt for the TDC Hole in the Rear Cylinder Block - Tightening Specification”](#), page 109.



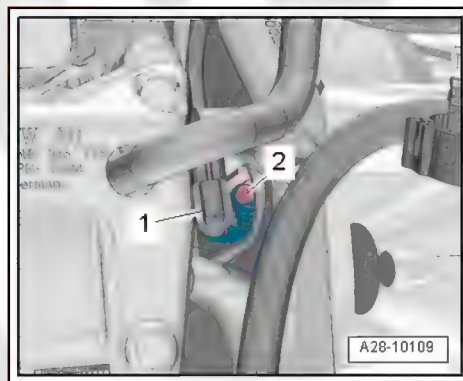
- Remove the plug for the “TDC” hole in the cylinder block.
- If the Crankshaft Locking Pin -T10340- cannot be installed all the way, then the crankshaft is not in the correct position.
- In this case, proceed as follows:
- Remove the locking pin.
- Turn the crankshaft 90° in the direction of engine rotation.
- Install the Crankshaft Locking Pin -T10340- all the way into the cylinder block and tighten to 30 Nm.
- Continue to turn the crankshaft in the direction of engine rotation until it stops.
- Install the Crankshaft Locking Pin -T10340- all the way into the cylinder block and tighten to 30 Nm.
- Turn the crankshaft all the way in direction of engine rotation.
- The locking pin is touching the crankshaft counterweight.



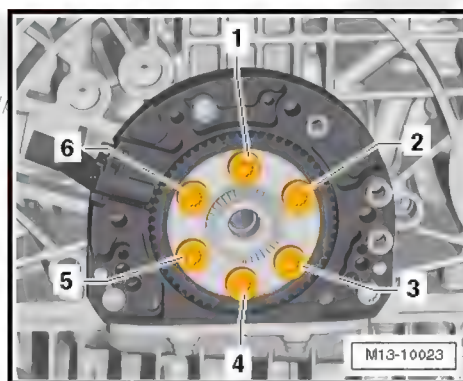
### Note

*The Crankshaft Locking Pin -T10340- locks the crankshaft only in direction of engine rotation.*

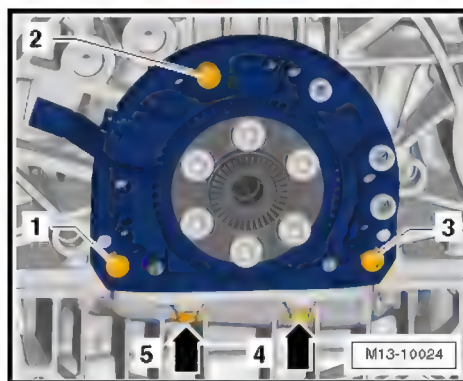
- Remove the oil pan upper section. Refer to ➤ [P1.4 Oil Pan Upper Section, Removing and Installing](#), page 245 .
- Remove the Engine Speed Sensor -G28- -1-. Refer to ➤ [E1.6 Engine Speed Sensor G28, Removing and Installing](#), page 437 .



- Remove the bolts -1 through 6-.



- Remove the bolts -1 through 3-.



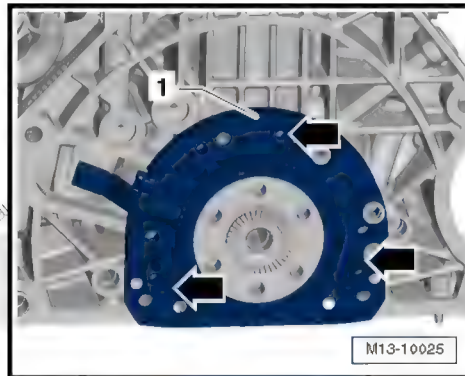
### Note

*The bolts -4 and 5- are already removed.*



**Note**

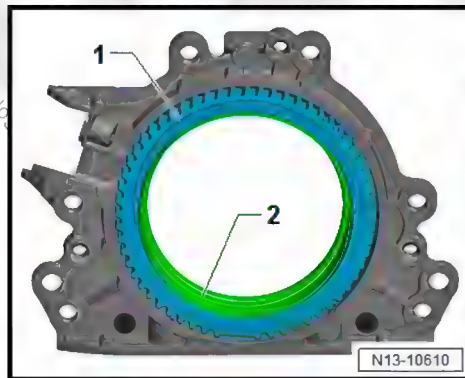
*The sealing flange and the sensor wheel are removed from the crankshaft together.*



- Install the three M 6 x 35 bolts -arrows- into the sealing flange alternating from side to side maximum  $\frac{1}{2}$  turn.
- Remove the sealing flange -1- and the sensor wheel.

**Sealing Flange with Sensor Wheel, Installing****Note**

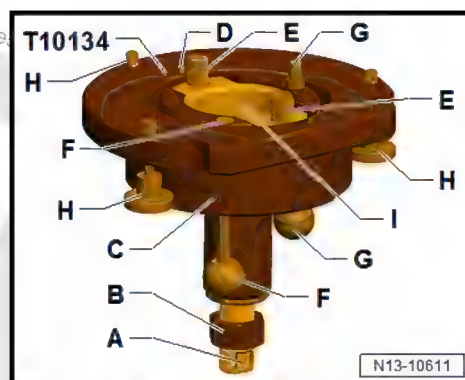
*The sealing flange with PTFE-seal is equipped with a sealing lip support ring -2-. This support ring serves the same function of a guide sleeve and must not be removed before installation.*



- ◆ *The sealing flange and sensor wheel -1- may not be separated or rotated after being removed from the replacement part packaging.*
- ◆ *The sensor wheel -1- retains the installation position by securing it on the locating pin of the Seal Installer - Rear Crankshaft -T10134-. Refer to [⇒ page 128](#).*
- ◆ *The sealing flange and seal are one unit and may only be replaced together with the sensor wheel.*
- ◆ *The Seal Installer - Rear Crankshaft -T10134- retains the installation position to the crankshaft via a guide pin, which is guided into the hole of the crankshaft. Refer to [⇒ page 128](#).*



## Installing the Seal Installer - Rear Crankshaft -T10134-



A - Tension Surface

B - Nut

C - Assembly Bell

D -  
Locating Pin

E - Hex Socket Bolt (Quantity: 2)

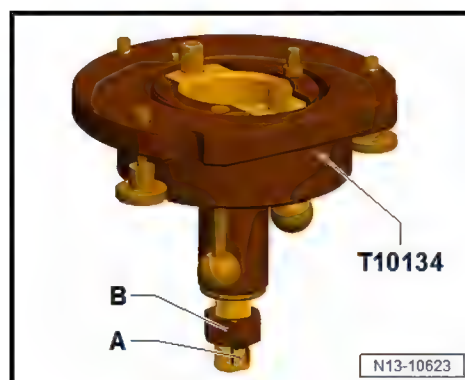
F -  
Guide Pin for Gasoline Engines (Red Handle)

G - Guide Pin for Diesel Engines (Black Handle)

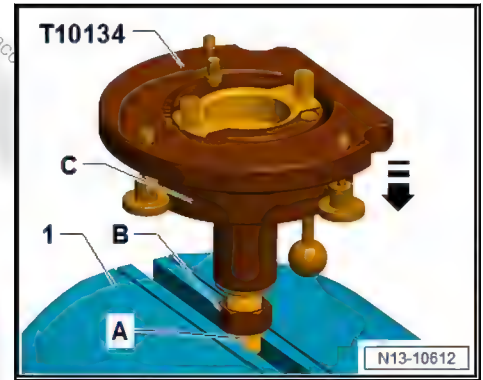
H - Knurled Bolts (Quantity: 3)

I - Inner section

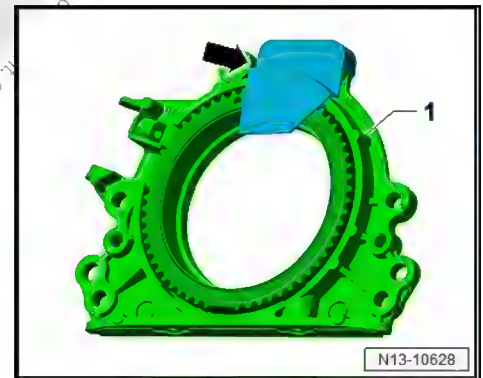
## Securing the Sealing Flange with Sensor Wheel on the Seal Installer - Rear Crankshaft -T10134-



- Install the nut -B- just up to the tension surface -A- on the threaded spindle.
- Tension the Seal Installer - Rear Crankshaft -T10134- in a vise -1- by the tension surface -A- on the threaded spindle.



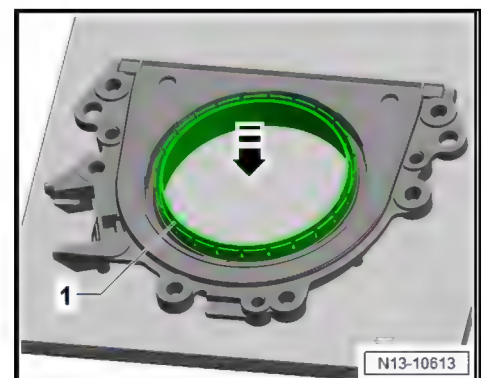
- Push the assembly bell -C- downwards so that it touches the nut -B-.
- The inner part of the assembly tool and assembly bell must be on the same level.
- If equipped, remove the securing clip -arrow- from the new sealing flange.



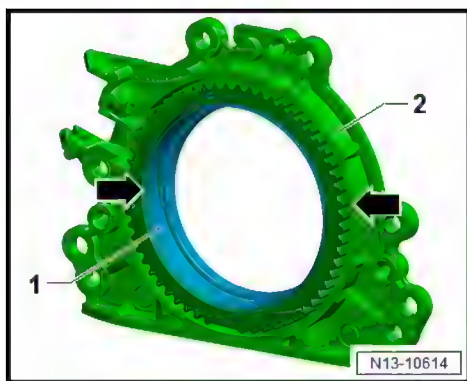
**Note**

*Do not turn the sensor wheel or remove it from the sealing flange.*

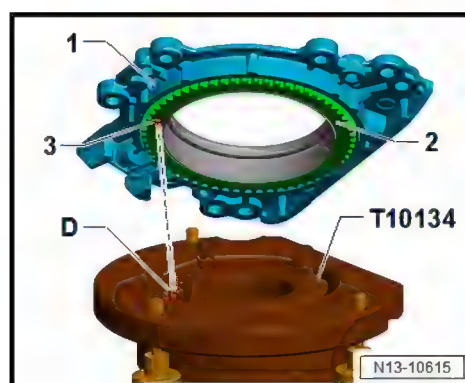
- Place the sealing flange on the front side on a clean level surface.



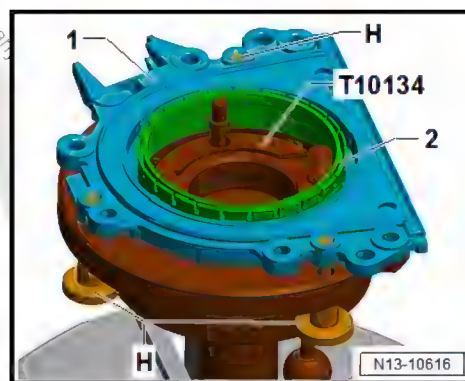
- Press the sealing lip support ring -1- downward in direction of -arrow- until it rests on the level surface.
- Sealing lip support ring upper edge -1- and the front edge of the sealing flange -2- must be flush -arrows-.



- Position the sealing flange -1- with the front side on the Seal Installer - Rear Crankshaft -T10134- so that the locating pin -D- sits in the hole -3- on the sensor wheel -2-.



- The sealing flange must lie flat on the assembly tool.
- Remove the knurled bolts -H- from the sealing flange -1-.

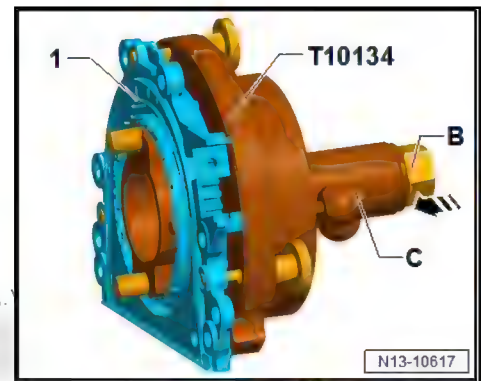


- Push the sealing flange -1- and the sealing lip support ring -2- while tightening on the surface of the Seal Installer - Rear Crankshaft -T10134-.
- This way the locating pin can no longer slide out of the sensor wheel hole.
- Make sure the sensor wheel remains fixed inside the assembly tool when installing the sealing flange.

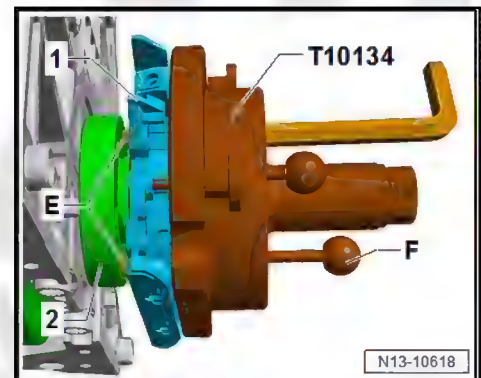




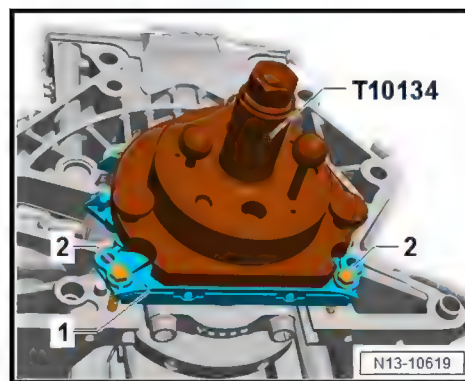
### Secure the Seal Installer - Rear Crankshaft -T10134- with the Sealing Flange -1- on the Crankshaft Flange



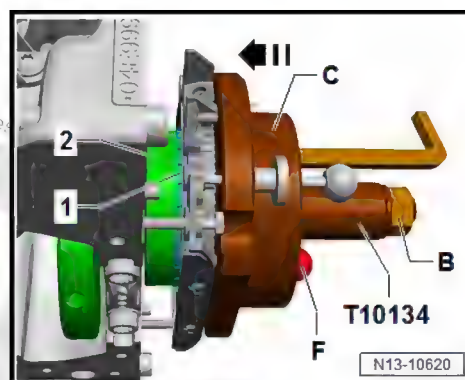
- The crankshaft flange must be free of oil and grease.
- The engine is at "TDC". Refer to [page 124](#).
- Install the nut -B- up to the end of the threaded spindle.
- Press the threaded spindle on the Seal Installer - Rear Crankshaft -T10134- in the direction of -arrow- until the nut -B- touches the assembly bell -C-.
- Align the flattened side of the assembly bell with the oil pan side sealing surface of the cylinder block.
- Secure the Seal Installer - Rear Crankshaft -T10134- together with the sealing flange -1- on the crankshaft flange -2-.



- To do this insert the hex socket bolts -E- to approximately five threads on the crankshaft flange with a hex socket wrench.
- Insert the gasoline engine guide pins (red handle) -F- in the crankshaft flange.
- Install two M6 x 35 bolts -2- into the cylinder block to guide the sealing flange -1-.



### Seal Installer - Rear Crankshaft -T10134-, Attaching to Crankshaft Flange



- Slide the assembly bell -C- in the direction of -arrow- by hand until the sealing lip support ring -1- touches the crankshaft flange -2-.
- Check if the guide pin for gasoline engines (red handle) -F- is seated correctly in the crankshaft hole. Thereby the sensor wheel is retained in the final installation position.



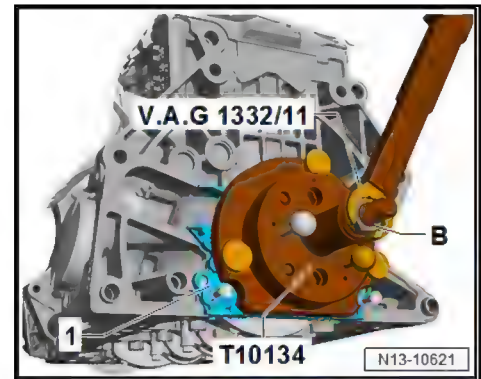
#### Note

*The guide pin for diesel engines (black handle) must not be inserted into the threaded hole in the crankshaft.*

- Tighten both hex socket bolts on the assembly tool hand-tight.
- Install the nut -B- as far as possible on the threaded spindle by hand until it touches the assembly bell -C-.

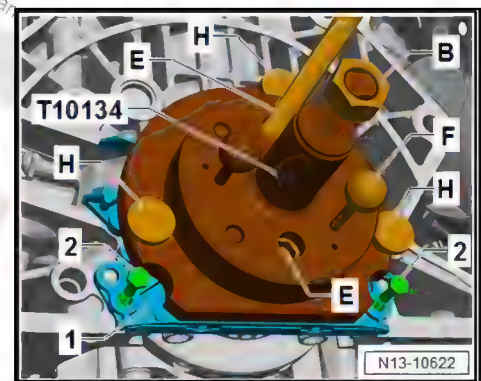


## Sensor Wheel, Pressing on Crankshaft Flange with Seal Installer - Rear Crankshaft -T10134-

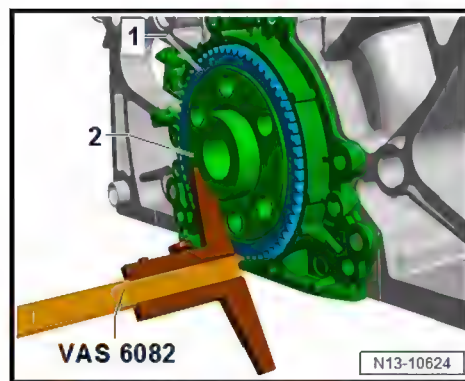


- Tighten the Seal Installer - Rear Crankshaft -T10134- nut -B- to 35 Nm.
- After tightening the nut to 35 Nm, a small air gap must still be present between the cylinder block and the sealing flange -1-.

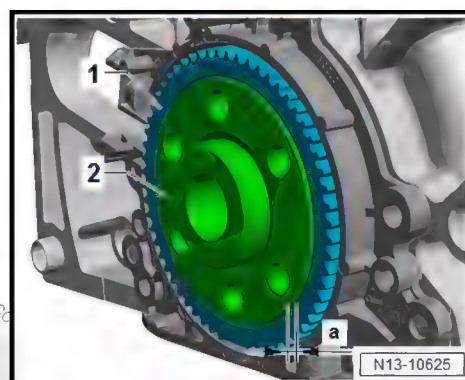
## Sensor Wheel Installation Position on Crankshaft, Checking



- Install the nut -B- up to the end of the threaded spindle.
- Remove both bolts -2- from the cylinder block.
- Remove the gasoline engine guide pins (red handle) -F- from the crankshaft flange.
- Remove the knurled bolts -H- from the sealing flange -1-.
- Remove the hex socket bolts -E- from the crankshaft flange and remove the Seal Installer - Rear Crankshaft -T10134- from the crankshaft flange.
- Remove the sealing lip support ring.
- Attach the Depth Gauge -VAS 6082- to the crankshaft flange -2-.

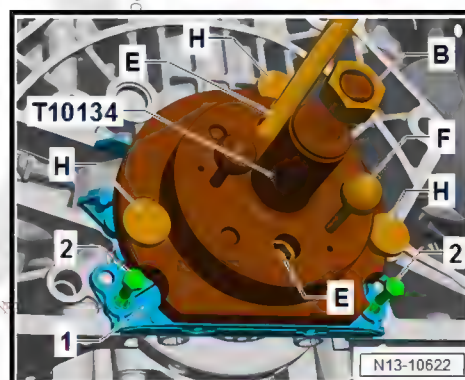


- Measure the distance -a- between the crankshaft flange -2- and the sensor wheel -1-.



- Specified value: dimension -a- = 0.5 mm
- Install the sensor wheel again if the specified value is too small. Refer to [⇒ page 134](#).
- When the specified value is reached, perform the rest of the assembly. Refer to [⇒ page 135](#).

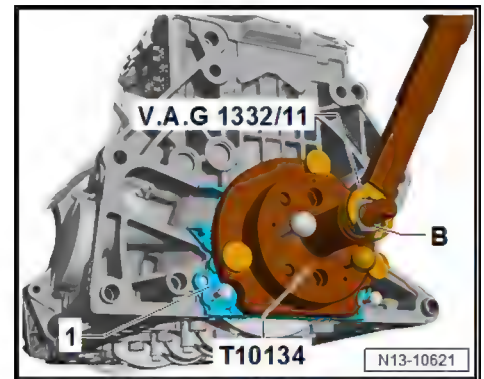
#### Sensor Wheel, Pressing On



- Secure the Seal Installer - Rear Crankshaft -T10134- on the crankshaft flange -1-.
- Pay attention that the Seal Installer - Rear Crankshaft -T10134- locating pin is seated in the sensor wheel hole.
- Tighten the hex socket bolts -E- hand-tight.
- Push the Seal Installer - Rear Crankshaft -T10134- by hand to the sealing flange -1-.
- Install the nut -B- as far as possible on the threaded spindle by hand until it touches the Seal Installer - Rear Crankshaft -T10134-.



- Insert the gasoline engine guide pins (red handle) -F- in the crankshaft flange.
- Push the knurled bolts -H- in the sealing flange -1-.
- Install two M6 x 35 bolts -2- into the cylinder block to guide the sealing flange.
- Tighten the Seal Installer - Rear Crankshaft -T10134- nut -B- to 40 Nm.



- Check the sensor wheel installation position on the crankshaft one more time. Refer to ⇒ [page 133](#) .
- Tighten the nut on the Seal Installer - Rear Crankshaft - T10134- to 45 Nm if the specified value is too small.
- Check the sensor wheel installation position on the crankshaft one more time. Refer to ⇒ [page 133](#) .

### Assembling

- Tighten the sealing flange bolts diagonally.
- Install the oil pan upper section. Refer to ⇒ [P1.4 an Upper Section, Removing and Installing](#) , page 245 .
- Install the oil pan lower section. Refer to ⇒ [P1.3 an Lower Section, Removing and Installing](#) , page 240 .
- Install the Electric Drive Motor -V141-. Refer to ⇒ [E1.5 lectric Drive MotorV141, Attaching to Engine](#) , page 41 .
- Connect the ⇒ Vehicle diagnostic tester.
- After replacing the sensor wheel an adaptation of the combustion misfire must be performed. To do so select the function **01 - Reset combustion misfire adaptation** in **Guided Functions**.

### Tightening Specifications

- ◆ Refer to ⇒ [Fig. ""Transmission Side Sealing Flange - Tightening Specifications and Sequence""](#) , page 122
- ◆ Refer to ⇒ [-2.1 Cylinder Block, Transmission Side](#) , page 119
- ◆ Refer to ⇒ [-1.1 Ignition System](#) , page 429
- ◆ Refer to ⇒ [Fig. ""Plug for TDC Hole in Cylinder Block - Tightening Specification""](#) , page 167

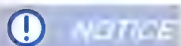


### 3 Crankshaft

⇒ [D3.1 imensions", page 136](#)

⇒ [M3.2 easuring Axial Clearance", page 136](#)

#### 3.1 Crankshaft Dimensions



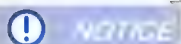
There is a risk of damaging the bearing block when removing the crankshaft.

Loosening the crankshaft bearing cap bolts deforms the cylinder block bearing block and causes bearing damage.

- Never remove the crankshaft.

Honing Dimension	Crankshaft Connecting Rod Journal Diameter mm
Standard dimension	48.00 -0.022 -0.042

#### 3.2 Crankshaft, Measuring Axial Clearance



There is a risk of damaging the bearing block when removing the crankshaft.

Loosening the crankshaft bearing cap bolts deforms the cylinder block bearing block and causes bearing damage.

- Never remove the crankshaft.

Special tools and workshop equipment required

- ◆ Dial Gauge Holder -VW 387-

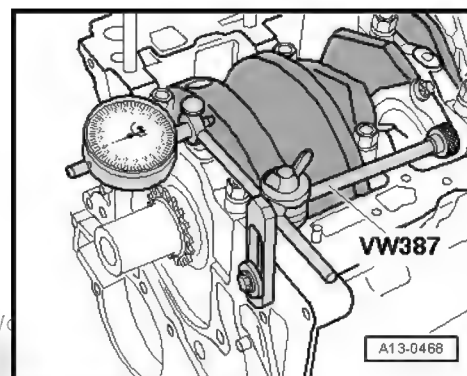


- ◆ Dial Gauge - 0-10mm -VAS 6079-





## Procedure



- Install the Dial Gauge - 0-10mm -VAS 6079- with the Dial Gauge Holder -VW 387- on the cylinder block as shown.
- Place the dial gauge against the crankshaft counterweight.
- Press the crankshaft against the dial gauge by hand and set the dial gauge to "0".
- Press the crankshaft off the dial gauge and read the measured value.
- Axial play: 0.066 to 0.233 mm.



## 4 Pistons and Connecting Rod

⇒ [4.1 Pistons and Connecting Rod", page 138](#)

⇒ [R4.2 emoving and Installing", page 141](#)

⇒ [a4.3 nd Cylinder Bore, Checking", page 143](#)

⇒ [R4.4 ods, Checking Radial Clearance", page 145](#)

⇒ [S4.5 pray Jets, Removing and Installing", page 145](#)

### 4.1 Overview - Pistons and Connecting Rod





**1 - Bolts**

- ☐ 30 Nm +90°
- ☐ Replace after removing

**2 - Connecting Rod Bearing Cap**

- ☐ Due to the separation procedure (cracking) of the connecting rod, the connecting rod bearing cap only fits in one position and only to the corresponding connecting rod.
- ☐ Mark the allocation to the cylinder and connecting rod with paint -B-.
- ☐ Installed position: the tab -A- on the connecting rod bearing cap faces the belt pulley side.

**3 - Bearing Shells**

- ☐ Replace any worn bearing shells
- ☐ Installation position. Refer to ⇒ [Fig. "Bearing Shell Installation Position", page 140](#).

**4 - Connecting Rod**

- ☐ Always replace as a set
- ☐ With a cracked connecting rod bearing cap
- ☐ Mark allocation to the cylinder and connecting rod bearing cap with paint -B-
- ☐ Radial play, measuring. Refer to ⇒ [R4.4 ods, Checking Radial Clearance", page 145](#).
- ☐ New connecting rod, separating. Refer to ⇒ [Fig. "New Connecting Rod, Separating", page 140](#).
- ☐ Installed position: the tab -A- on the connecting rod bearing cap faces the belt pulley side.

**5 - Circlip**

- ☐ Replace after removing
- ☐ Quantity: 2

**6 - Piston Pin**

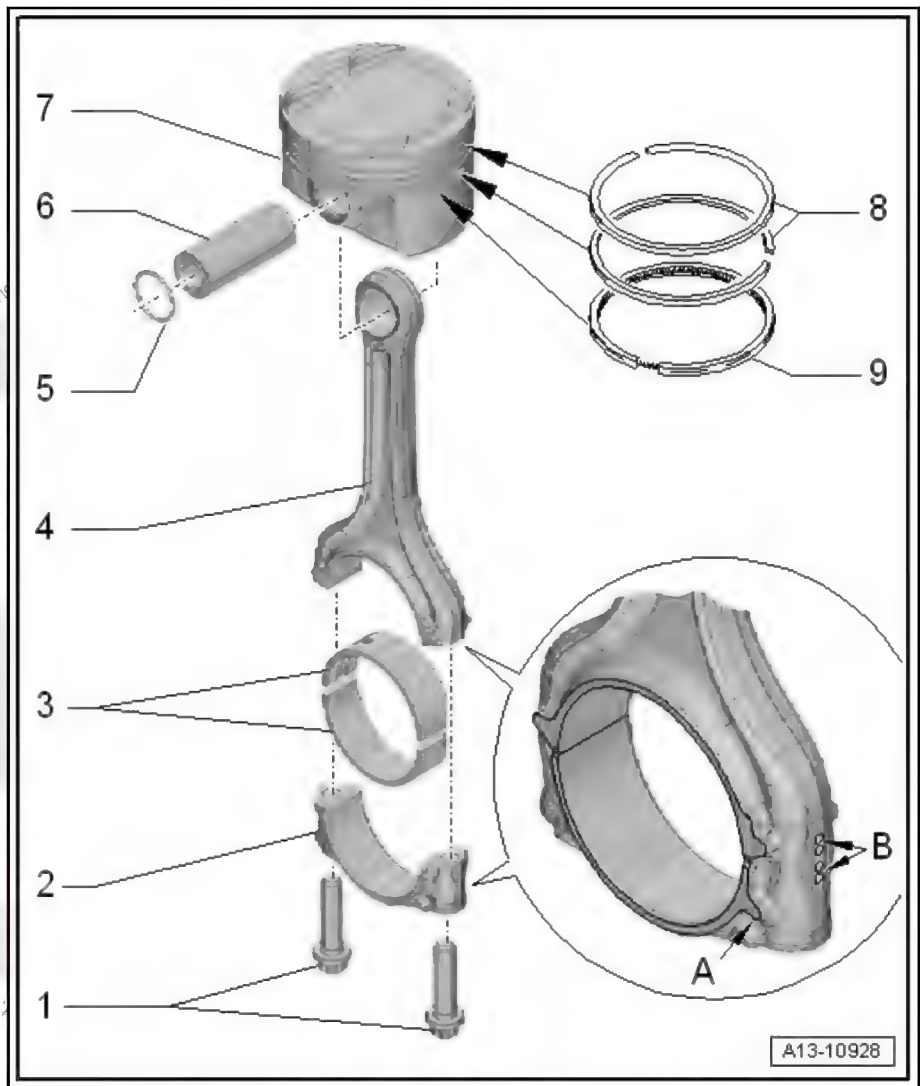
- ☐ Removing and Installing. Refer to ⇒ [R4.2 emoving and Installing", page 141](#).

**7 - Piston**

- ☐ With combustion chamber
- ☐ Label the installation position and cylinder allocation. Refer to ⇒ [Fig. "Piston Installation Location and Allocation, Piston to Cylinder", page 140](#).
- ☐ Removing and Installing. Refer to ⇒ [R4.2 emoving and Installing", page 141](#).
- ☐ Check piston and cylinder bore. Refer to ⇒ [a4.3 nd Cylinder Bore, Checking", page 143](#).

**8 - Piston Rings**

- ☐ Compression Rings
- ☐ Measuring the gap. Refer to ⇒ [Fig. "Piston Ring Gap, Measuring", page 143](#).
- ☐ Measuring side clearance. Refer to ⇒ [Fig. "Piston Ring Height Clearance, Measuring", page 143](#).



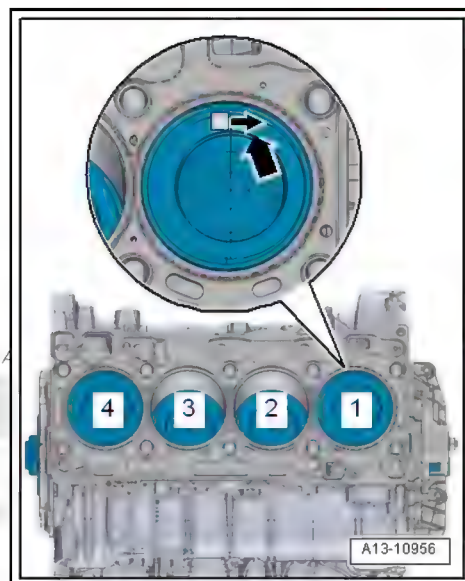


- ☐ Use piston ring pliers (commercially available) for removing and installing
- ☐ Installation position: "TOP" lettering or side with lettering faces the piston crown.
- ☐ Offset gaps by 120°

#### 9 - Piston Ring

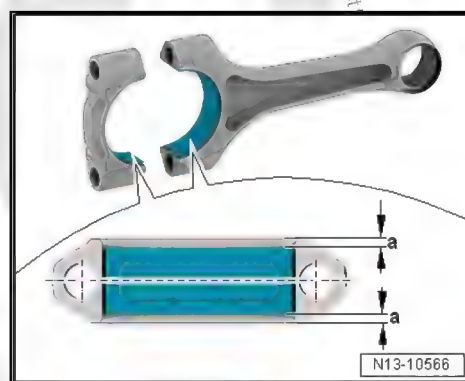
- ☐ Oil Scraping Ring
- ☐ Measuring the gap. Refer to ➤ [Fig. "Piston Ring Gap, Measuring", page 143](#) .
- ☐ Measuring side clearance. Refer to ➤ [Fig. "Piston Ring Height Clearance, Measuring", page 143](#) .
- ☐ Use piston ring pliers for removing and installing
- ☐ Installation position: "TOP" lettering or side with lettering faces the piston crown.
- ☐ Offset gaps by 120° on the lower compression ring

#### Piston Installation Location and Allocation, Piston to Cylinder



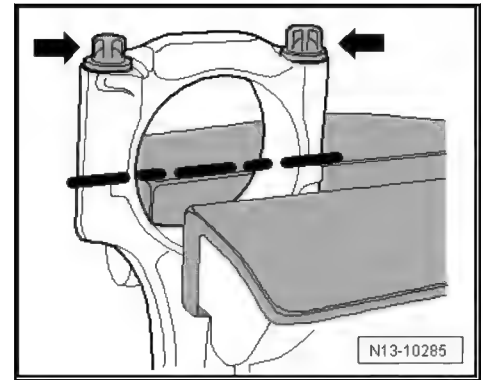
- Arrow on the piston crown facing the belt pulley side -arrow-.

#### Bearing Shell Installation Position



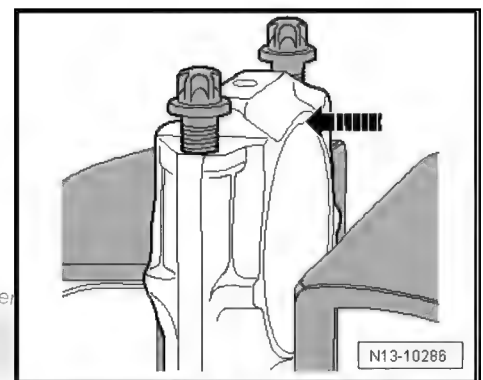
- Install the bearing shells in the center of the connecting rod and into the connecting rod bearing cap.
- Dimension -a- = dimension -a-.

#### New Connecting Rod, Separating

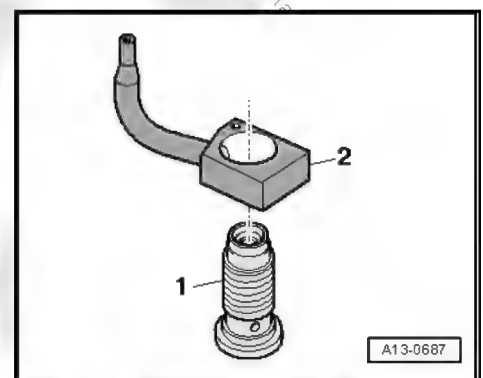


New connecting rods might not be completely separated at the predetermined breaking point. If the connecting rod bearing cap cannot be removed by hand, proceed as follows:

- To prevent damage, only clamp the connecting rod lightly in a vise with protective covers over the jaws as shown.
- Clamp the connecting rod below the dotted line.
- Remove the bolts -arrows- approximately five turns.
- Carefully tap the connecting rod bearing cap with a plastic hammer -arrow- until it comes loose.



#### Oil Spray Jet and Pressure Relief Valve



- 1 - Bolt with Pressure Relief Valve - 27 Nm
- 2 - Piston Cooling Oil Spray Jet

Removing and Installing. Refer to [S4.5 pray Jets, Removing and Installing](#), page 145 .

## 4.2 Pistons, Removing and Installing

Special tools and workshop equipment required





◆ Pilot Drift -VW 222 A-



◆ Piston ring mounting strap, commercially available

**Removing**

- Remove the cylinder head. Refer to [H1.3 ead, Removing and Installing](#), page 152 .
- Remove the oil pan upper section and remove the oil baffle. Refer to [P1.4 an Upper Section, Removing and Installing](#), page 245 .
- Label the installation position and the piston allocation to the cylinder.
- Mark the installed position and which connecting rod belongs to which cylinder and to which connecting rod bearing cap -item 4- [⇒ Item 4 \(page 139\)](#) .
- Remove the connecting rod bearing cap and remove the piston and connecting rod upward.



**Note**

*If difficult to move, heat the pistons to approximately 60 °C (140 °F).*

- Remove the circlip from the piston pin eye.
- Remove the piston pin using the Pilot Drift -VW 222 A-

**Installing**

Install in the reverse order of removal while noting the following:



**Note**

*Replace the bolts that were tightened with an additional turn.*

- Coat the contact surfaces on the bearing shells with oil.
- Install the piston with a commercially available piston ring compressor. Pay attention to the installation position Refer to [⇒ Fig. ""Piston Installation Location and Allocation, Piston to Cylinder""](#), page 140 .
- Install the connecting rod bearing cap. Pay attention to the installation position -item 2- [⇒ Item 2 \(page 139\)](#) .
- Install the cylinder head. Refer to [⇒ H1.3 ead, Removing and Installing](#), page 152 .
- Install the oil pan upper section. Refer to [⇒ P1.4 an Upper Section, Removing and Installing](#), page 245 .

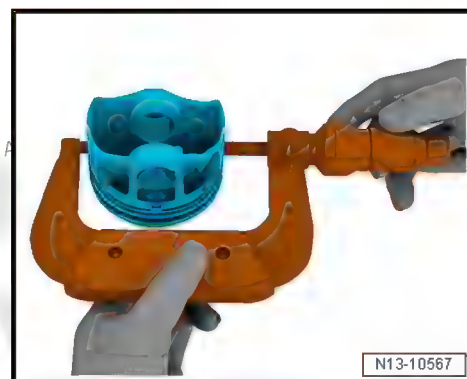


### Tightening Specifications

- ◆ Refer to ➤ Fig. “Oil Spray Jet and Pressure Relief Valve”, page 141
- ◆ Refer to ➤ -4.1 Pistons and Connecting Rod”, page 138
- ◆ Refer to ➤ -1.1 Oil Pan/Oil Pump”, page 236

## 4.3 Piston and Cylinder Bore, Checking

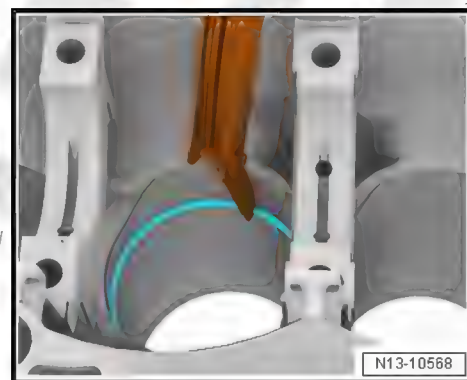
### Pistons, Checking



- Measure approximately 10 mm in from the lower edge at a 90° angle to the piston pin axis using an external micrometer.
- Maximum variance from the specified size: 0.04 mm.

Piston Diameter in mm	
Specified size	74.42 <sup>1)</sup>
• <sup>1)</sup> Dimension without coating (thickness 0.018 mm on each side)	

### Piston Ring Gap, Measuring



- Push the piston ring squarely from above down to approximately 15 mm from the bottom end of the cylinder.
- Use a piston without a piston ring for pushing it in.

Piston Ring	New mm	Wear Limit mm
Compression ring	0.20 <sup>+0.15</sup>	1.0
Oil Scraping Ring	0.20 <sup>+0.20</sup>	3.0

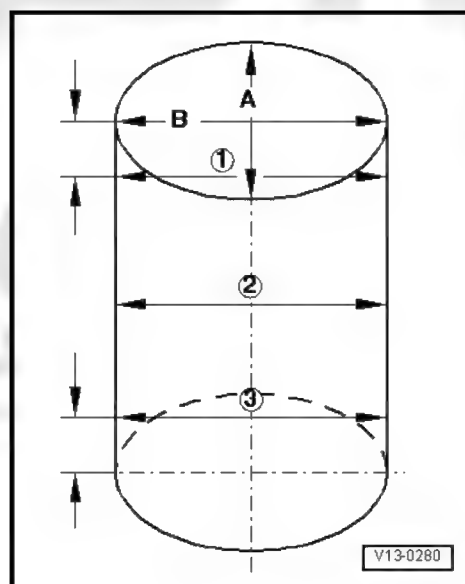
### Piston Ring Height Clearance, Measuring



- Clean the piston ring groove before checking.

Piston Ring	New mm	Wear Limit mm
1. Compression ring	0.05 to 0.09	0.15
2. Compression ring	0.03 to 0.07	0.15
Oil scraping rings	cannot be measured	

#### Cylinder Bore, Measuring



#### NOTICE

Risk of damaging the cylinder bore surface through incorrect handling.

- Never handle the cylinder bore with service equipment (drilling, honing, grinding).
- Using the Cylinder Dial Bore Gauge -VAS 6078-, measure in a diagonal sequence at three positions transversely -A- and longitudinally -B-.
- Maximum variance from the specified size: 0.08 mm.

Cylinder Bore Diameter in mm	
Specified size	$74.5 + 0.015^{1)}$ $+0.005$

**Note**

*The cylinder bore must not be measured when the cylinder block is mounted on the Engine and Gearbox Bracket -VAS 6095A- because the measurements may be incorrect.*

## 4.4 Connecting Rods, Checking Radial Clearance

### Special tools and workshop equipment required

- ◆ Plastigage

### Procedure

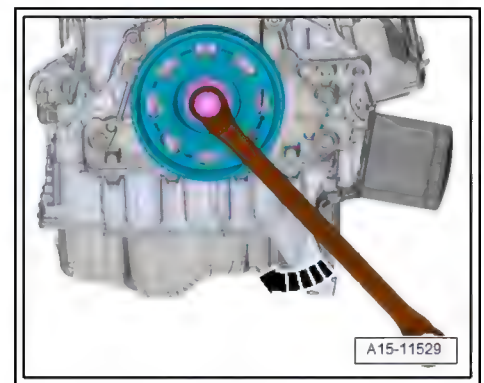
- Remove the connecting rod bearing cap.
- Clean the bearing cap and pin.
- Place the plastigage over the entire width of the bearing journal or into the bearing shells.
- Install the connecting rod bearing cap and tighten it to 30 Nm without any additional turns. While doing so, do not turn the crankshaft.
- Remove the connecting rod bearing cap again.
- Compare the width of Plastigage with the measuring scale.
- Radial clearance: 0.028 to 0.065 mm.
- Replace connecting rod bolts after removing.

## 4.5 Oil Spray Jets, Removing and Installing

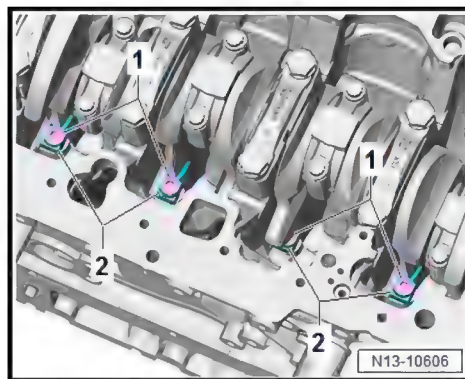
### Special tools and workshop equipment required

- ◆ Socket - T10545-

### Removing

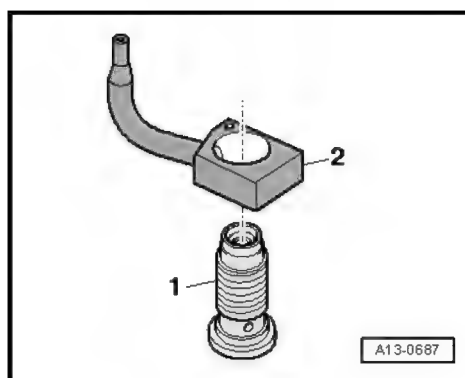


- Remove the oil pan upper section and remove the oil baffle. Refer to [P1.4 an Upper Section, Removing and Installing](#), page 245.
- Turn the crankshaft on the vibration damper in the direction of engine rotation -arrow-, until the respective bolt is reachable.
- Remove the pressure relief valve -1- using the Torx Bit - T40 -T10545-.



- Remove the oil spray jet -2-.

#### Installing



Install in the reverse order of removal while noting the following:

- Installation position: the guiding edge of the oil spray jet -2- to the machined surface of the cylinder block.

#### 1. Relief Valve



There is a risk of damaging the oil spray jets through distortions.

- Never bend the oil spray jets.
- Install the oil pan upper section. Refer to ⇒ [P1.4 an Upper Section, Removing and Installing](#), page 245 .
- Install the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation.

#### Tightening Specifications

- ◆ Refer to ⇒ [-4.1 Pistons and Connecting Rod](#), page 138
- ◆ Refer to ⇒ [-1.1 Oil Pan/Oil Pump](#), page 236







## 15 – Cylinder Head, Valvetrain

### 1 Cylinder Head

⇒ [1.1 "Cylinder Head", page 147](#)

⇒ [1.2 "Camshaft Housing", page 149](#)

⇒ [1.3 "Cylinder Head, Removing and Installing", page 152](#)

⇒ [1.4 "Camshaft Housing, Removing and Installing", page 157](#)

⇒ [1.5 "Valvetrain", page 162](#)

#### 1.1 Overview - Cylinder Head





#### 1 - Cylinder Head Gasket

- ☐ Replace after removing. Refer to ➤ [H1.3 ead, Removing and Installing", page 152](#).
- ☐ Installed position: the part number faces the cylinder head

#### 2 - Alignment Sleeve

- ☐ Quantity: 2

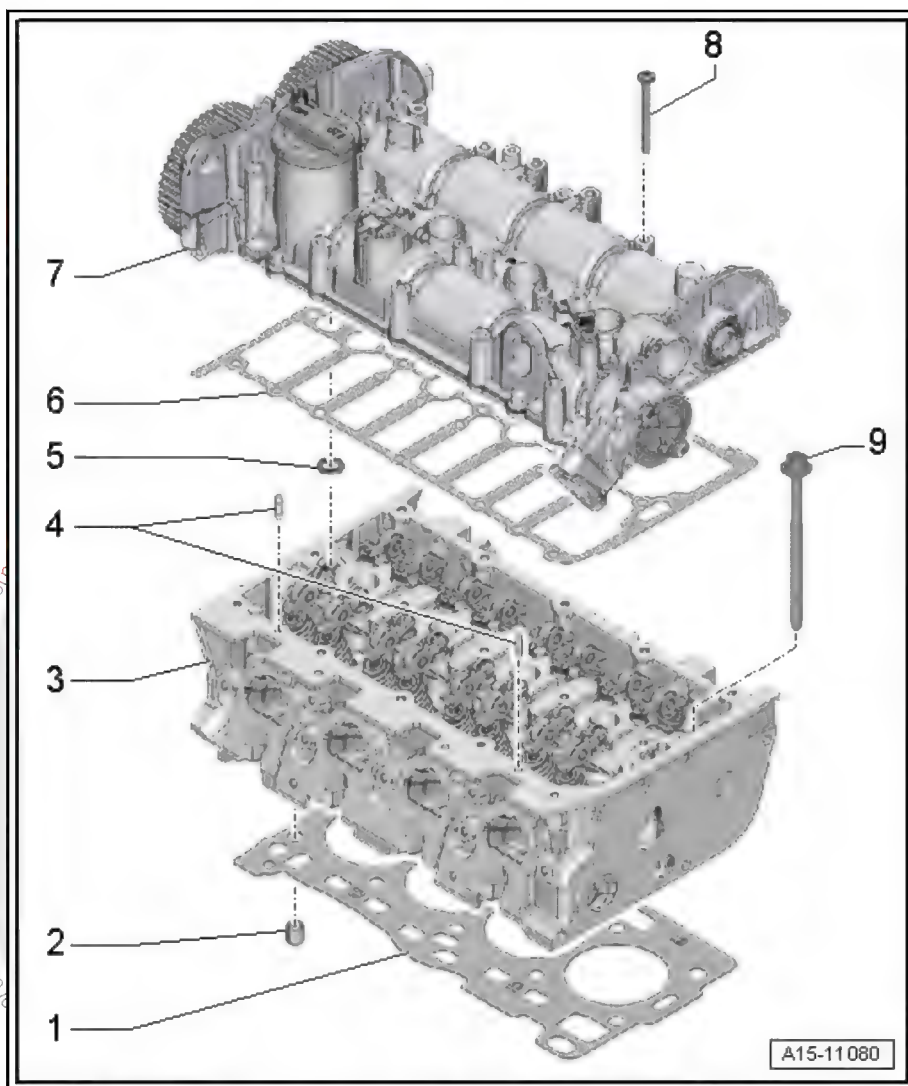
#### 3 - Cylinder Head

- ☐ Removing and Installing. Refer to ➤ [H1.3 ead, Removing and Installing", page 152](#).
- ☐ Checking for distortion. Refer to ➤ [Fig. "Cylinder Head, Checking for Distortion", page 149](#).

#### 4 - Alignment Pins

#### 5 - Seal

- ☐ With oil strainer
- ☐ Installed in the cylinder head



#### Note

- ◆ The oil screen may only be installed if the cylinder head has the corresponding recess for it.
- ◆ Cylinder heads without a recess do not require an oil screen.

#### 6 - Seal

- ☐ Replace after removing

#### 7 - Camshaft Housing

- ☐ Removing and Installing. Refer to ➤ [H1.4 ousing, Removing and Installing", page 157](#).

#### 8 - Bolt

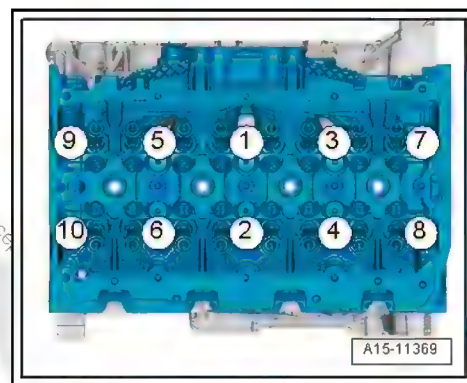
- ☐ Tightening specification and sequence. Refer to ➤ [Fig. "Camshaft Housing - Tightening Specification and Sequence", page 151](#).

#### 9 - Bolt

- ☐ Replace after removing
- ☐ Loosening sequence. Refer to ➤ [page 154](#).
- ☐ Tightening specification and sequence. Refer to ➤ [Fig. "Cylinder Head - Tightening Specification and Sequence", page 149](#).



## Cylinder Head - Tightening Specification and Sequence



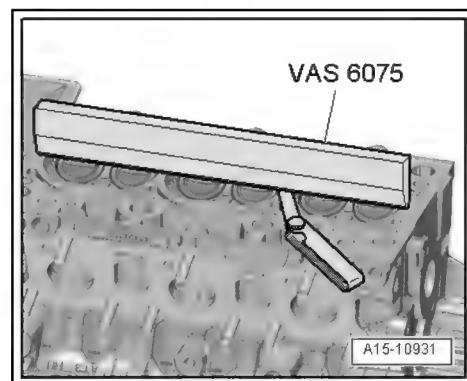
### Note

*Replace the bolts that were tightened with an additional turn.*

- Tighten the bolts in steps in the sequence -1 to 10-:

Step	Component	Tightening Specification/Additional Turn
1	Bolts -1 through 10-	40 Nm
2	Bolts -1 through 10-	90° additional turn
3	Bolts -1 through 10-	90° additional turn
4	Bolts -1 through 10-	90° additional turn

## Cylinder Head, Checking for Distortion



- Check the cylinder head at several locations for distortion using a Straight Edge - 500mm -VAS 6075- and a feeler gauge.
- Maximum permissible distortion: 0.05 mm

## 1.2 Overview - Camshaft Housing



#### 1 - Exhaust Camshaft Adjustment Valve 1 -N318-

- ❑ Removing and Installing. Refer to ➤ [E3.6 Exhaust Camshaft Adjustment Valve 1N318, Removing and Installing](#), page 223 .

#### 2 - Bolt

- ❑ 8 Nm

#### 3 - Camshaft Adjustment Valve 1 -N205-

- ❑ Removing and Installing. Refer to ➤ [C3.5 Camshaft Adjustment Valve 1N205, Removing and Installing](#), page 223 .

#### 4 - Camshaft Housing

- ❑ Removing and Installing. Refer to ➤ [H1.4 Camshaft Housing, Removing and Installing](#), page 157 .

#### 5 - Camshaft Position Sensor 3-G300-

- ❑ Removing and Installing. Refer to ➤ [C1.5.2 Camshaft Position Sensor 3G300, Removing and Installing](#), page 436 .

#### 6 - Bolt

- ❑ 8 Nm

#### 7 - Camshaft Position Sensor -G40-

- ❑ Removing and Installing. Refer to ➤ [C1.5.1 Camshaft Position Sensor G40, Removing and Installing](#), page 435 .

#### 8 - Seal

- ❑ For the exhaust camshaft on the transmission side
- ❑ Replace after removing. Refer to ➤ [S3.3 Seal, Removing and Installing](#), page 202 .

#### 9 - Toothed Belt Sprocket

- ❑ For the coolant pump
- ❑ Removing and Installing. Refer to ➤ [P2.7 Pump Toothed Belt Sprocket, Removing and Installing](#), page 308 .

#### 10 - Bolt

- ❑ Tightening specification Refer to ➤ [-2.1 Coolant Pump/Coolant Thermostat](#), page 285 .

#### 11 - Bolt

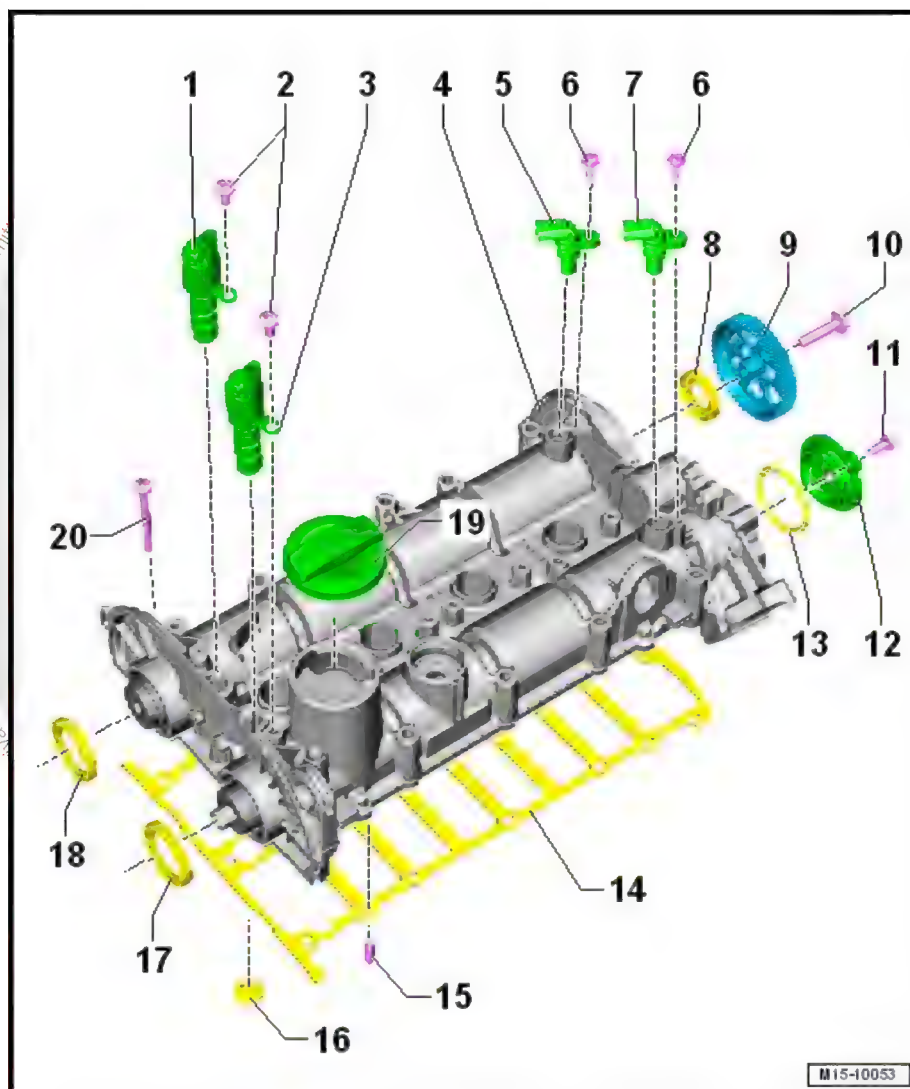
- ❑ 8 Nm

#### 12 - Cap

#### 13 - Seal

- ❑ Replace after removing

#### 14 - Seal







- ☐ Replace after removing

#### 15 - Alignment Pin

#### 16 - Seal

- ☐ With oil strainer
- ☐ The oil screen may only be installed if the cylinder head has the corresponding recess for it.
- ☐ Cylinder heads without a recess do not require an oil screen.
- ☐ Installed in the cylinder head

#### 17 - Seal

- ☐ Replace after removing. Refer to [⇒ S3.3.1 eal for Intake Camshaft, Removing and Installing, Belt Pulley Side", page 202](#) .
- ☐ For the belt pulley side intake camshaft

#### 18 - Seal

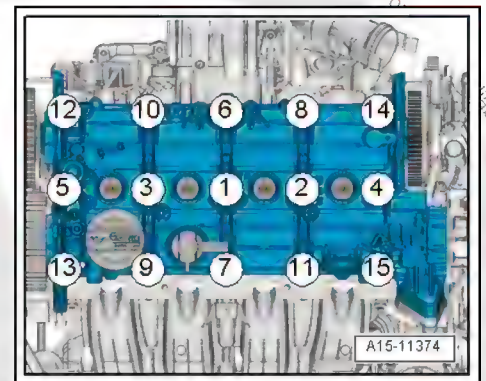
- ☐ Replace after removing. Refer to [⇒ S3.3.2 eal for Exhaust Camshaft on Belt Pulley Side, Removing and Installing", page 204](#) .
- ☐ For the belt pulley side exhaust camshaft

#### 19 - Cap

#### 20 - Bolt

- ☐ Tightening specification and sequence. Refer to [⇒ Fig. ""Camshaft Housing - Tightening Specification and Sequence""](#), page 151 .
- ☐ Different lengths installed

### Camshaft Housing - Tightening Specification and Sequence



- 1 - Bolts -1 through 4-: M6 × 52
- 2 - Bolts -5 through 15-: M6 × 65
- Replace the bolts that were tightened with an additional turn.



#### Note

*There are different bolt lengths.*

- Tighten the bolts in the steps in the sequence shown:

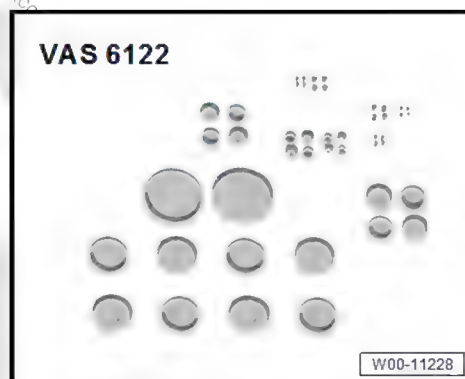
Step	Component	Tightening Specification/Additional Turn
1	Bolts -1 to 15-	10 Nm
2	Bolts -1 to 15-	180° additional turn



## 1.3 Cylinder Head, Removing and Installing

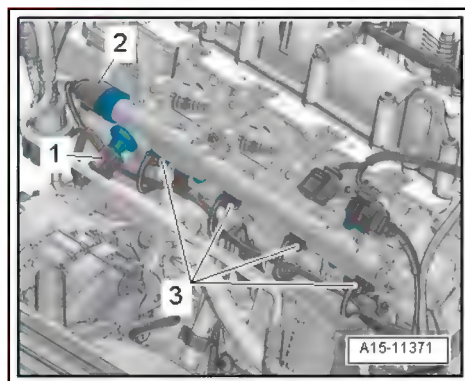
### Special tools and workshop equipment required

- ♦ Engine Bung Set -VAS 6122-

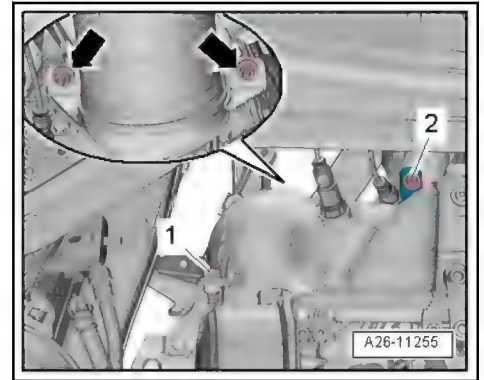


### Removing

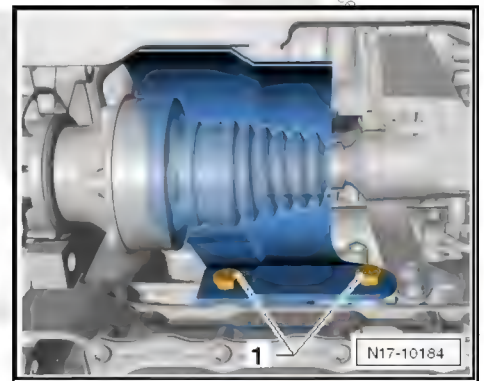
- During installation, all heat shields must be reinstalled at the same location.
- Seal the open channel with suitable plugs from the Engine Bung Set -VAS 6122-.
- Secure all standard production hose clamps. Refer to the ⇒ Electronic Parts Catalog (ETKA).
- Cover the opening of the transmission with a cleaning cloth, so that no fluid enters the clutch housing.
- Remove the camshaft housing. Refer to ⇒ [H1.4 Housing, Removing and Installing](#), page 157 .
- Remove the intake manifold. Refer to ⇒ [M3.2 Intake Manifold, Removing and Installing](#), page 376 .
- Disconnect the connectors:



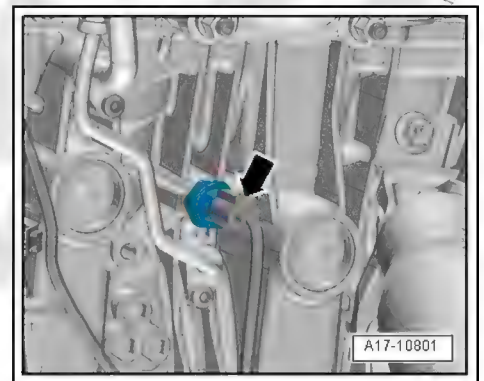
- 1 - From the Reduced Oil Pressure Switch -F378-
  - 2 - From the Fuel Pressure Sensor -G247-
  - 3 - On the Cylinder 1 Fuel Injector -N30- through Cylinder 4 Fuel Injector -N33-
- Remove the bolt -2- and the screw-type clamp.



- Remove the bolt -1- and the nuts -arrows- and tie up the catalytic converter.
- Remove the bolts -1- and remove the right drive axle heat shield.



- Remove the heat shield boot.



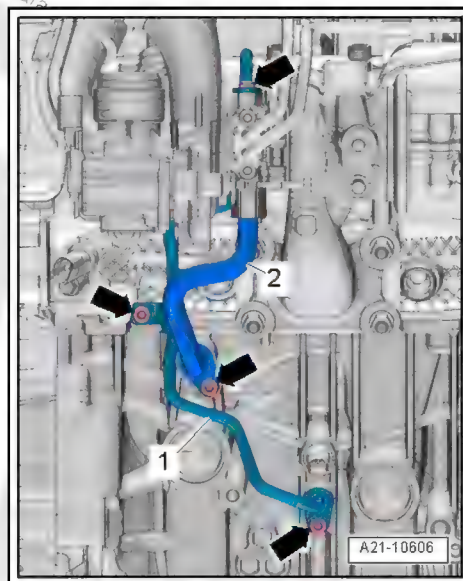
- Disconnect the connector -arrow- from the Oil Pressure Switch -F22-.

#### Vehicles with Secondary Air System

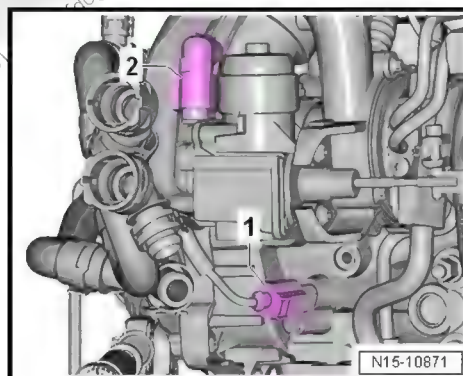
- Remove the secondary air injection pump motor. Refer to [⇒ S3.2 econdary Air Injection Pump MotorV101, Removing and Installing”, page 427](#) .



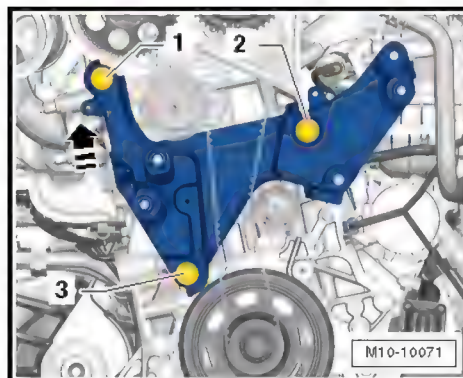
## Continuation for All Vehicles



- Remove the bolts -arrows- and then remove the oil supply line -1- and oil return pipe -2-.
- Disconnect the connectors:

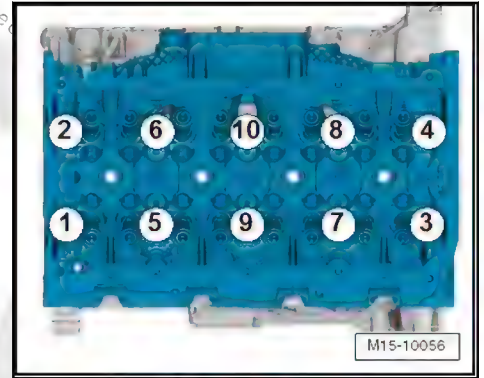


- 1 - For Engine Coolant Temperature Sensor -G62-
- 2 - For Charge Air Pressure Actuator -V465-
- Remove the bolt -1- on the engine support.



- Loosen and remove the cylinder head bolts in the sequence -1 to 10-.





- Remove the cylinder head and place it on a soft surface (foam).

**i** Note

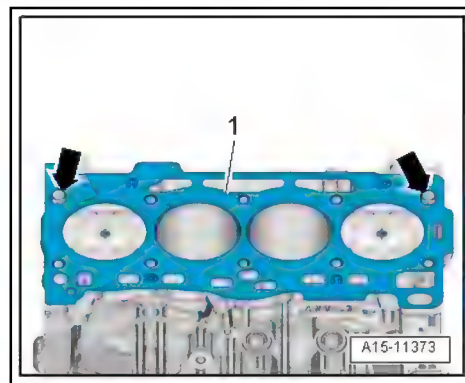
*Using a cleaning cloth immediately remove coolant that is sitting on the piston and adhered to the cylinder wall.*

**Installing**

**i** Note

- ◆ *There is a risk of damaging the sealing surfaces.*
- ◆ *Carefully remove the sealant residue from the cylinder head and cylinder block.*
- ◆ *Make sure that no long grooves or scratches result.*
- ◆ *Risk of damaging the cylinder block.*
- ◆ *There must be no oil or coolant in the blind holes for the cylinder head bolts in the cylinder block.*
- ◆ *Risk of the cylinder head gasket leaking.*
- ◆ *Carefully remove all grinding and sanding residue.*
- ◆ *Only unpack the new cylinder head gasket immediately before installing.*
- ◆ *To prevent the cylinder head gasket silicone layer and recessed area from being damaged, always handle the gasket extremely carefully.*
- ◆ *If a replacement cylinder head is being installed, the contact surfaces between the hydraulic lifters, the roller rocker levers and the cam running surfaces must be oiled before the camshaft housing is installed.*

- Replace the bolts that were tightened with an additional turn.
- Replace self-locking nuts, sealing rings, seals and O-rings.
- Do not reuse coolant that has been drained.
- Install the cylinder head gasket -1-.



- ◆ Pay attention to centering pins in cylinder block -arrows-.
- ◆ Pay attention to the cylinder head gasket installation position: the part number must be readable from the intake side.

If the crankshaft was turned in the meantime: bring the piston for cylinder 1 to TDC and then turn the crankshaft back again slightly.

- Position the cylinder head.
- Insert the cylinder head bolts and tighten by hand.
- Tighten the cylinder head bolts. Refer to ⇒ [Fig. "Cylinder Head - Tightening Specification and Sequence", page 149](#).



#### Note

*It is not required to retighten the cylinder head bolts after repairs.*

Install in reverse order of removal. Note the following:

- Install the camshaft housing. Refer to ⇒ [H1.4 Housing, Removing and Installing", page 157](#).
- Install the intake manifold. Refer to ⇒ [M3.2 Intake Manifold, Removing and Installing", page 376](#).
- Change the engine oil. Refer to ⇒ Maintenance; Booklet.
- Fill the coolant. Refer to ⇒ [D1.3 Filling and Filling", page 275](#).

#### Tightening Specifications

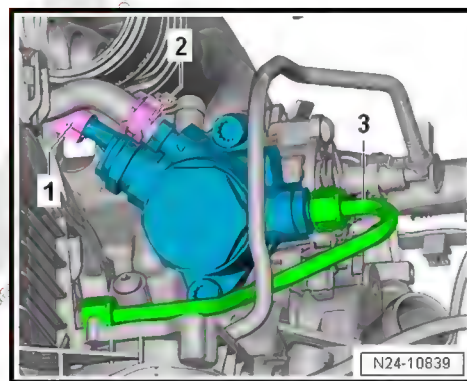
- ◆ Refer to ⇒ [Fig. "Engine Mount Bracket", page 73](#)
- ◆ Refer to ⇒ [-1.1 Cylinder Head", page 147](#)
- ◆ Refer to ⇒ [-1.1 Turbocharger", page 327](#)
- ◆ Refer to ⇒ [-2.1 Charge Air System", page 345](#)
- ◆ Refer to ⇒ [-3.1 Intake Manifold", page 373](#)
- ◆ Refer to ⇒ [Fig. "Installing the Catalytic Converter - Tightening Specification and Sequence", page 419](#)
- ◆ Drive Axle, Removing and Installing. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40; Drive Axle; Drive Axle, Removing and Installing.



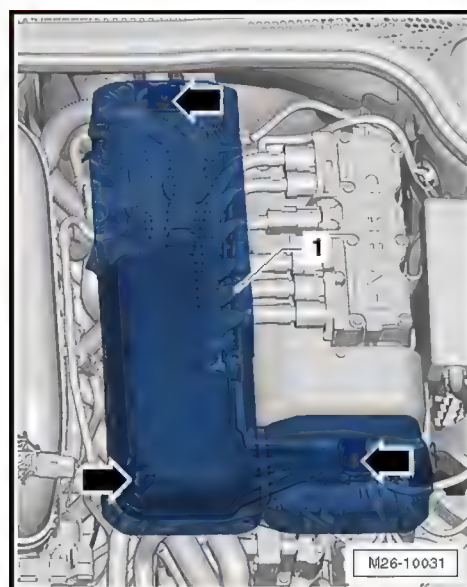
## 1.4 Camshaft Housing, Removing and Installing

### Removing

- Remove the coolant pump. Refer to [⇒ P2.5 ump, Removing and Installing](#), page 297 .
- Remove the air filter housing. Refer to [⇒ F2.2 ilter Housing, Removing and Installing](#), page 370 .
- Remove the ignition coils. Refer to [⇒ C1.3 oils with Power Output Stages, Removing and Installing](#), page 431 .
- Remove the toothed belt from the camshafts. Refer to [⇒ B2.7 elt, Removing from Camshafts](#), page 193 .
- Disconnect the connector -1-.

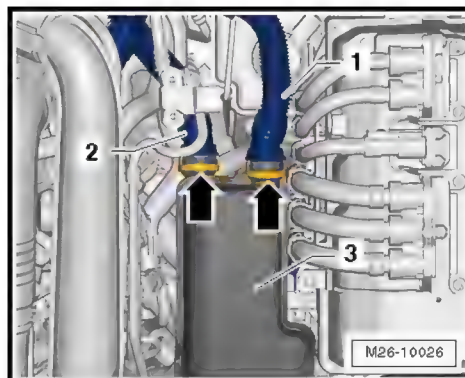


- Loosen the clamp -2- and remove the hose.
- Remove the high pressure pipe -3-. Refer to [⇒ P6.3 ressure Pipe, Removing and Installing](#), page 398 .
- Unclip and remove the cover -1- upward from the retainers -arrows-.

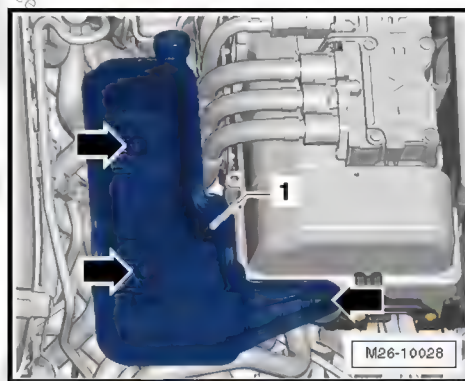




## Vehicles with Secondary Air System

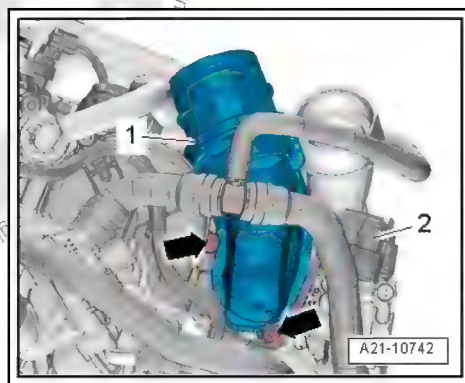


- Disconnect the air line -1- and 2- from the damper -3-. To do so, press the locking rings -arrows- together on both sides and disconnect the lines.
- Remove the damper -1- upward from the rubber bushings -arrows-.



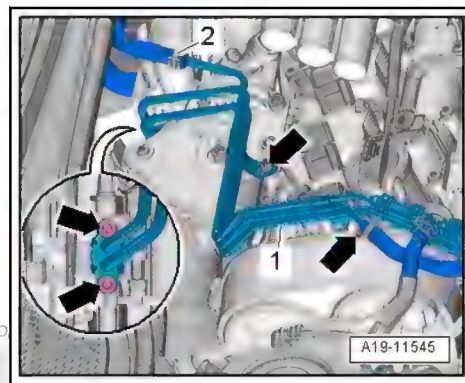
- Separate the air connection line from the connection.

## Continuation for All Vehicles

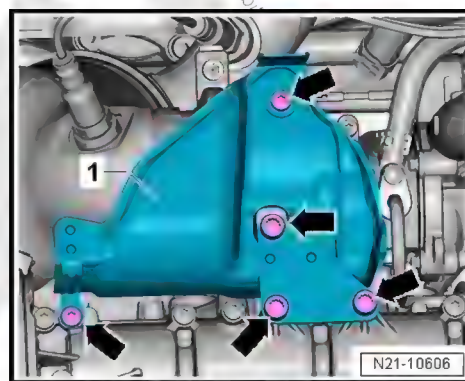


- Disconnect the connector -2-.
- Remove the bolts -arrows- and the connection -1-.
- Loosen the hose clamp -2- and remove the coolant hose.

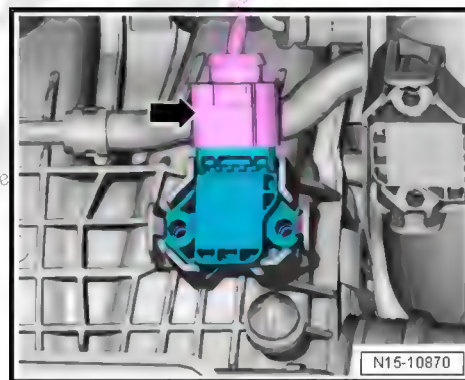




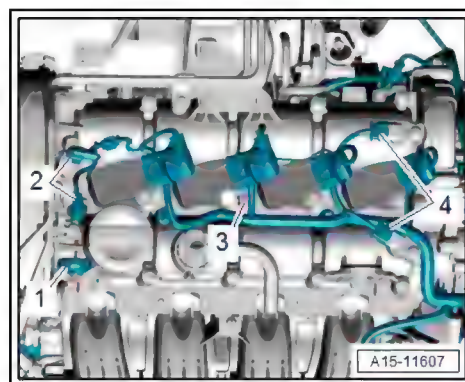
- Remove the bolts -arrows- and move the coolant lines -1- to the right.
- Remove the bolts -arrows- and remove the heat shield -1-.



- Disconnect the connector -arrow- from the Intake Manifold Sensor -GX9-.



- Disconnect the connectors:

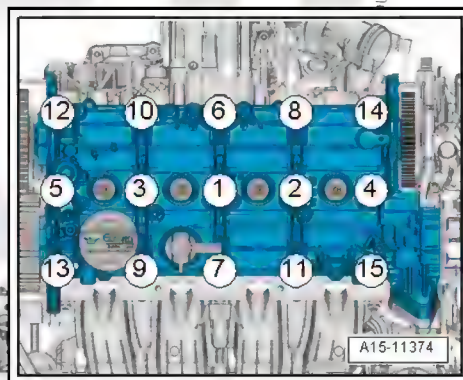




2 - For Camshaft Adjustment Valve 1 -N205-/Exhaust Camshaft Adjustment Valve 1 -N318-

4 - For Camshaft Position Sensor -G40-/Camshaft Position Sensor 2 -G163-

- Remove the bolt -3-, free up the wiring harness and move it to the left side.
- Remove the oil dipstick -1-.
- Loosen and remove the camshaft housing bolts in the sequence -15 to 1-.



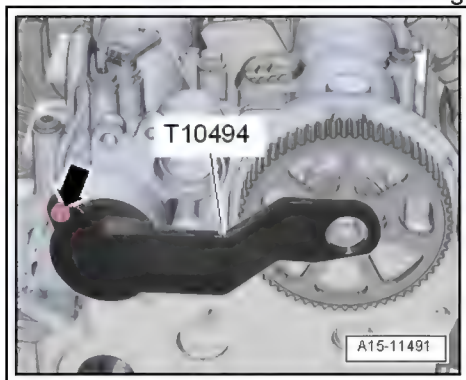
- Loosen and remove the camshaft housing carefully from the adhesive.
- Mark the allocation of the roller rocker lever and lifter for installation later.
- If necessary, remove the roller rocker levers with the hydraulic lifters and place them on a clean surface.

#### Installing



#### Note

- ◆ Replace the bolts that were tightened with an additional turn.
- ◆ Replace the gasket and the seal with the oil screen.
- Check the "TDC" position of the camshaft and crankshaft:
  - Camshaft Lock -T10494- mounted on camshaft housing.

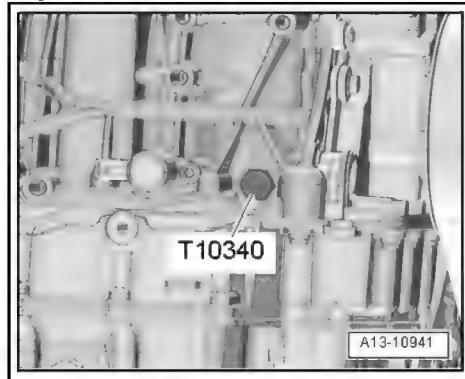




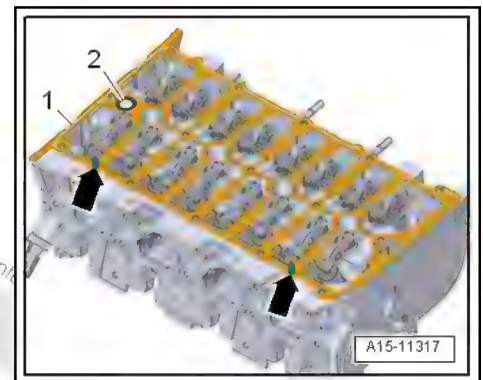
### ! NOTICE

There is a risk of damaging the valvetrain from an axial displacement on the camshafts.

- Never move the camshafts axially when turning.
- Crankshaft Locking Pin -T10340- installed all the way into the cylinder block and tightened to 30 Nm.



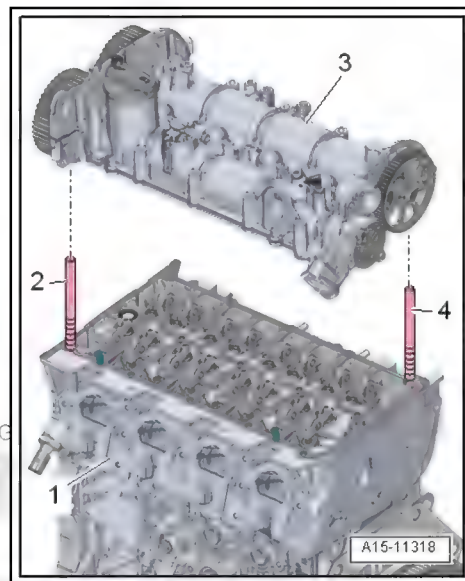
- Crankshaft in direction of engine rotation touching the Crankshaft Locking Pin -T10340- = "TDC" position.
- Make sure all roller rocker levers are mounted correctly on the valve shaft ends and are clipped to the lifters.



### Note

- ◆ *The oil screen may only be installed if the cylinder head has the corresponding recess for it.*
- ◆ *Cylinder heads without a recess do not require an oil screen.*
- Install the seal and oil screen -2- in the cylinder head -1-.
- Place the seal on the alignment pins -arrows-.
- Install the two threaded pins -2 and 4-, for example the Centering Tool -T10288/4-, into the cylinder head.





- Mount the camshaft housing -3- carefully vertically onto the threaded pins in the cylinder head from above.



#### Note

*Make sure the camshaft housing is not tilted.*

- Tighten the bolts for the camshaft housing. Refer to ➤ [Fig. "Camshaft Housing - Tightening Specification and Sequence", page 151](#).

Install in reverse order of removal. Note the following:

- Install the high pressure pipe. Refer to ➤ [P6.3 Pressure Pipe, Removing and Installing", page 398](#).
- Install the toothed belt (adjust valve timing). Refer to ➤ [B2.7 elt, Removing from Camshafts", page 193](#).
- Install the ignition coils. Refer to ➤ [C1.3 Coils with Power Output Stages, Removing and Installing", page 431](#).
- Install the coolant pump. Refer to ➤ [P2.5 ump, Removing and Installing", page 297](#).
- Connections and wire routing. Refer to ➤ [Wiring diagrams, Troubleshooting & Component locations](#).

Risk of damaging the valves and piston crowns after working on valvetrain.

- To ensure that the valves do not make contact when starting, carefully rotate the engine at least two full revolutions.

#### Tightening Specifications

- ◆ Refer to ➤ [-3.1 Valvetrain", page 199](#)
- ◆ Refer to ➤ [-1.1 Turbocharger", page 327](#)
- ◆ Refer to ➤ [-2.1 Air Filter Housing", page 368](#)

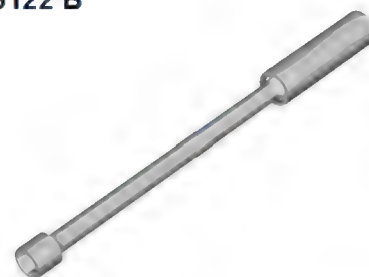
## 1.5 Compression, Checking

Special tools and workshop equipment required





## ◆ Spark Plug Removal Tool -3122 B-

**3122 B**

W00-11129

## ◆ Compression Tester Kit -V.A.G 1763-

**V.A.G 1763**

W00-11177

**Procedure**

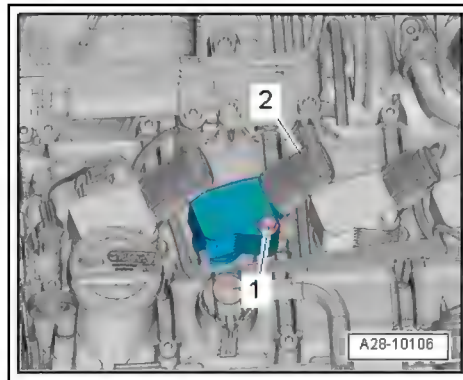
- Engine oil temperature at least 30 °C (86 °F).
- Battery voltage at least 12.5 V.
- Remove the fuse for the fuel pump control module from the fuse panel. Fuse assignment. Refer to ⇒ Wiring diagrams, Troubleshooting & Component locations.

**Note**

*Removing the fuse interrupts the voltage supply to the fuel pump control module.*

- Start the engine and let it run until it stops.
- Switch off the ignition.
- Remove the resonator for the intake air scoop. Refer to ⇒ [A2.3 in Scoop Resonator, Removing and Installing](#), page 371.
- Disconnect the connector -2- and remove the bolt -1-.





- Remove the ignition coils with power output stage.
- Remove the spark plugs using a Spark Plug Removal Tool -3122 B-.
- Check the compression using the Compression Tester Kit -V.A.G 1763-. Refer to the ⇒ Operating Manual.
- Have a second technician press the accelerator pedal all the way down and operate the starter at the same time, until a pressure increase is no longer displayed on the tester.
- Repeat the procedure on each cylinder.

Compression Pressure	Pressure
New	10.0 to 15.0 bar (145.03 to 217.55 psi)
Wear limit	7.0 bar (101.52 psi)
Maximum difference between cylinders	3.0 bar (43.51 psi)

### Assembling

Assemble in the reverse order of removal. Note the following:

- Install spark plugs.
- Install the ignition coils with power output stages. Refer to ⇒ [C1.3 coils with Power Output Stages, Removing and Installing](#), page 431 .
- The faults were stored in the engine control module DTC memories Generate Readiness Code in Guided Functions of the ⇒ Vehicle diagnostic tester, because the connectors were disconnected and the engine was started.



## 2 Toothed Belt Drive

⇒ [2.1 Toothed Belt Guard](#), page 165

⇒ [2.2 Toothed Belt](#), page 165

⇒ [B2.3 elt Guard, Removing and Installing](#), page 168

⇒ [B2.4 elt, Removing and Installing](#), page 169

⇒ [T2.5 iming, Checking](#), page 177

⇒ [T2.6 iming, Adjusting](#), page 184

⇒ [B2.7 elt, Removing from Camshafts](#), page 193

### 2.1 Overview - Toothed Belt Guard

#### 1 - Bolts

- ☐ 8 Nm

#### 2 - Lower Toothed Belt Guard

#### 3 - Engine Mount Bracket

- ☐ Tightening specification and sequence. Refer to ⇒ [B1.3 racket, Removing and Installing](#), page 111.

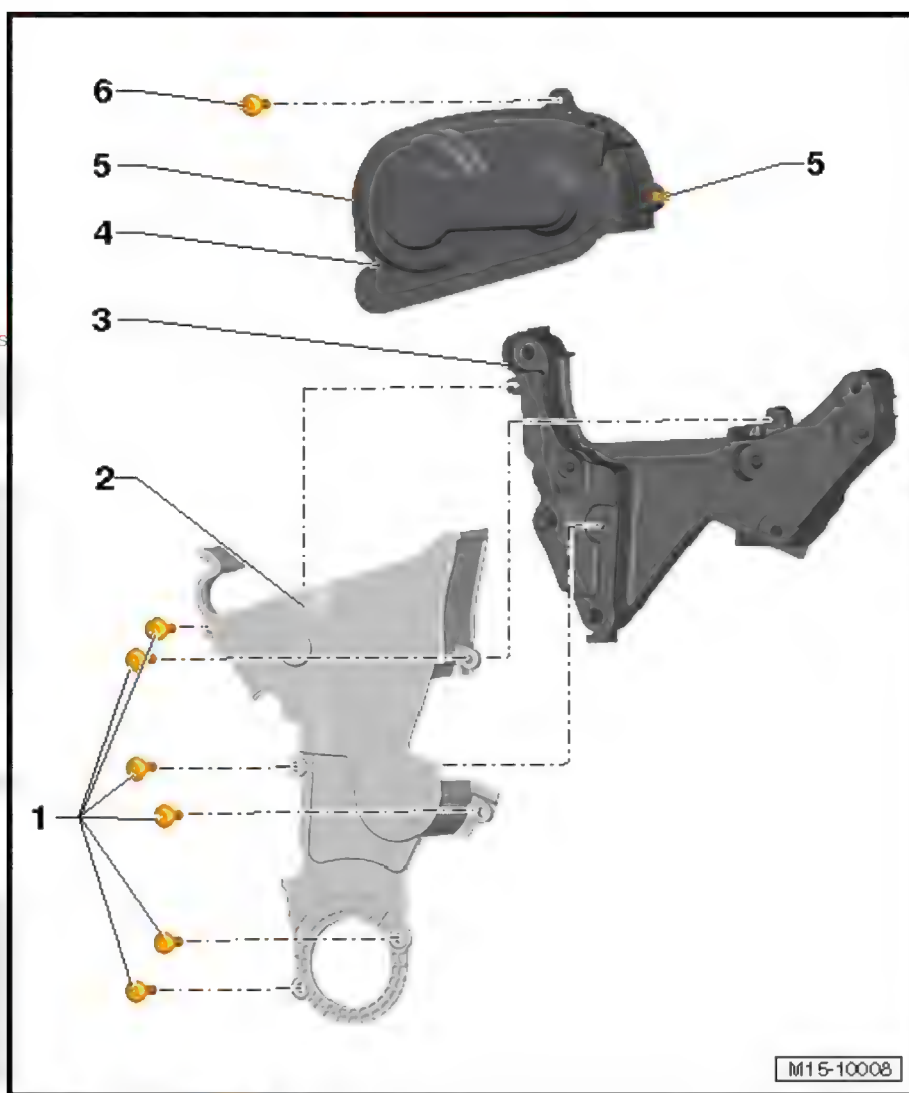
#### 4 - Upper Toothed Belt Guard

#### 5 - Spring Clip

- ☐ Make sure both spring clips are secure.

#### 6 - Bolt

- ☐ 8 Nm



### 2.2 Overview - Toothed Belt

## 1 - Toothed Belt

- ☐ Check for wear
- ☐ Removing. Refer to ➤ [B2.4 elt, Removing and Installing", page 169](#).
- ☐ Adjusting valve timing. Refer to ➤ [T2.6 iming, Adjusting", pages 184](#).
- ☐ Pay attention to the bending radius. Refer to ➤ [Fig. "Toothed Belt Bending Radius", page 172](#).

## 2 - Bolt

- ☐ 25 Nm

## 3 - Tensioning Roller

- ☐ To remove and install, remove the engine support. Refer to ➤ [M2.2 ount, Removing and Installing", page 74](#).

## 4 - Bolt

- ☐ 8 Nm +45°
- ☐ Replace after removing

## 5 - Cap

## 6 - Bolt

- ☐ Replace after removing
- ☐ Tightening specification and sequence. Refer to ➤ [page 215](#).

## 7 - Exhaust Camshaft Toothed Belt Sprocket

- ☐ With camshaft adjuster
- ☐ Camshaft adjuster, removing and installing. Refer to ➤ [C3.4.2 amshaft Adjuster, Removing and Installing", page 217](#).

## 8 - Guide Sleeve

## 9 - Intake Camshaft Toothed Belt Sprocket

- ☐ With camshaft adjuster
- ☐ Camshaft adjuster, removing and installing. Refer to ➤ [C3.4.1 amshaft Adjuster, Removing and Installing", page 211](#).

## 10 - Bolt

- ☐ Replace after removing
- ☐ Tightening specification and sequence. Refer to ➤ [page 215](#).

## 11 - Seal

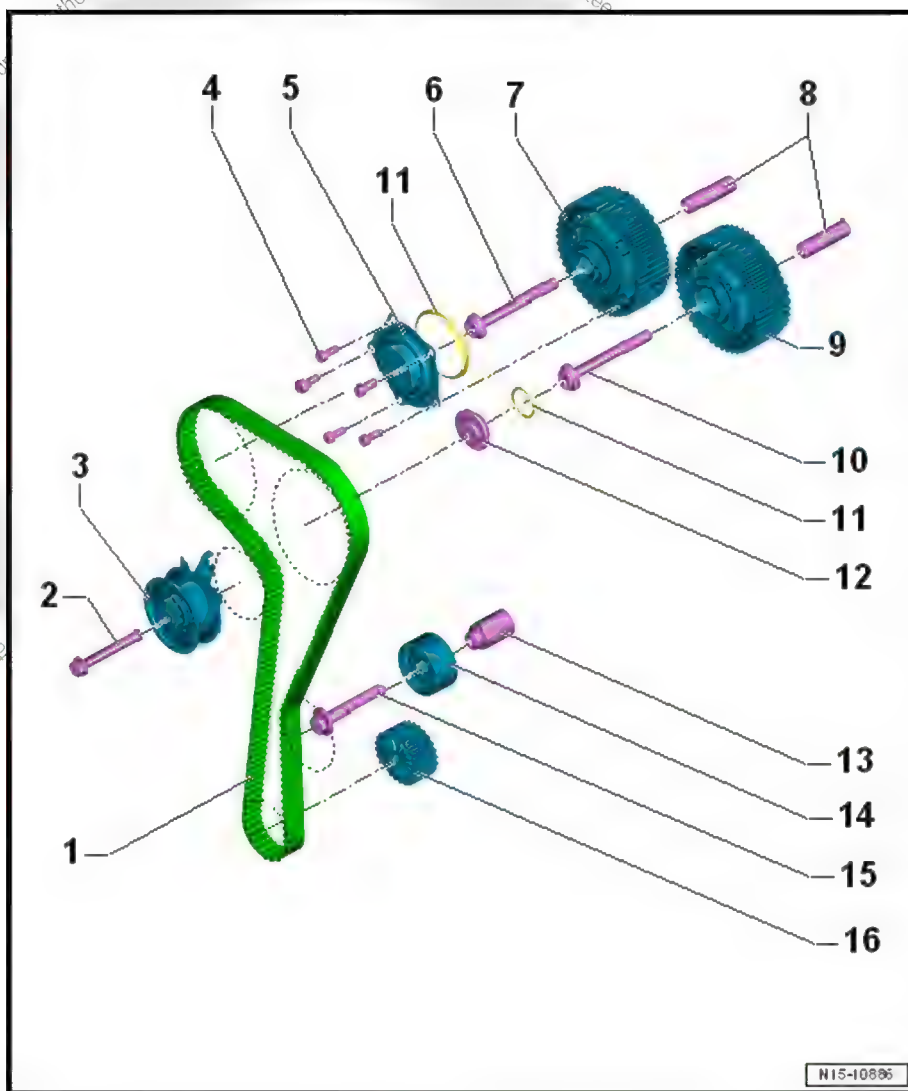
- ☐ Replace after removing

## 12 - Plug

- ☐ 20 Nm
- ☐ Replace after removing

## 13 - Spacer Sleeve

- ☐ Replace after removing





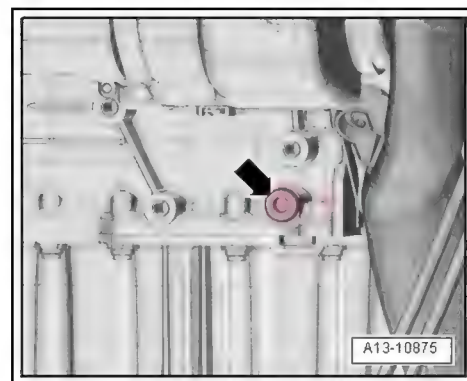
- ☐ With gasket
- ☐ Included in the delivery package "item 14"

**14 - Idler Roller****15 - Bolt**

- ☐ 45 Nm

**16 - Crankshaft Toothed Belt Sprocket**

- ☐ There must be no oil on the contact surface between the toothed belt sprocket and crankshaft
- ☐ Only possible to install in one position

**Plug for "TDC" Hole in Cylinder Block - Tightening Specification****Note**

*Replace the gasket if damaged.*

**Tightening Specifications**

Component	Tightening Specification
Bolt -arrow-	30 Nm



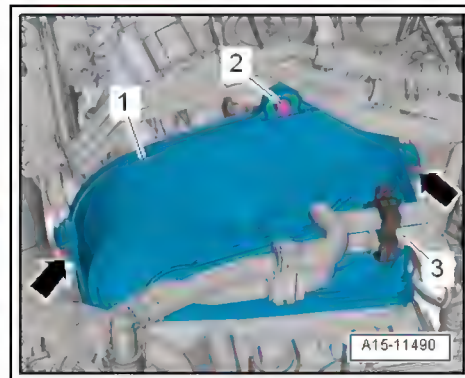
## 2.3 Toothed Belt Guard, Removing and Installing

⇒ [T2.3.1 oothed Belt Guard, Removing and Installing", page 168](#)

⇒ [T2.3.2 oothed Belt Guard, Removing and Installing", page 169](#)

### 2.3.1 Upper Toothed Belt Guard, Removing and Installing

#### Removing



- Free up the hoses on the bracket -3-.
- Remove the bolt -2-.
- Loosen the clamps -arrows- and remove the upper toothed belt guard -1-.

#### Installing

Install in reverse order of removal.

#### Tightening Specifications

- ◆ Refer to ⇒ [-2.1 Toothed Belt Guard", page 165](#)

## 2.3.2 Lower Toothed Belt Guard, Removing and Installing

### Removing



- Remove the vibration damper. Refer to [⇒ D1.2 amper, Removing and Installing, page 109](#).
- Remove the bolts -arrows-.
- Remove the lower toothed belt guard.

### Installing

Install in the reverse order of removal while noting the following:

- Install the vibration damper. Refer to [⇒ D1.2 amper, Removing and Installing, page 109](#).

### Tightening Specifications

- ◆ Refer to [⇒ -2.1 Toothed Belt Guard, page 165](#)
- ◆ Refer to [⇒ -1.1 Belt Pulley Side Sealing Flange, page 107](#)

## 2.4 Toothed Belt, Removing and Installing





Special tools and workshop equipment required



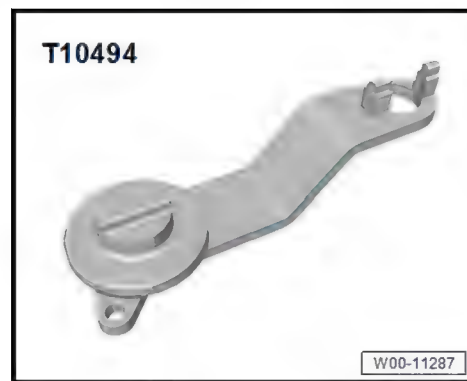
- ◆ Electronic Torque Wrench 3-60Nm -VAS 6583-
- ◆ Counterhold - Multiple Use -T10172A-
- ◆ Crankshaft Locking Pin -T10340-
- ◆ Counterhold - Pulley -T10475-
- ◆ Wrench - Open Ring - 30mm -T10499-
- ◆ Insert Tool - 13mm -T10500-







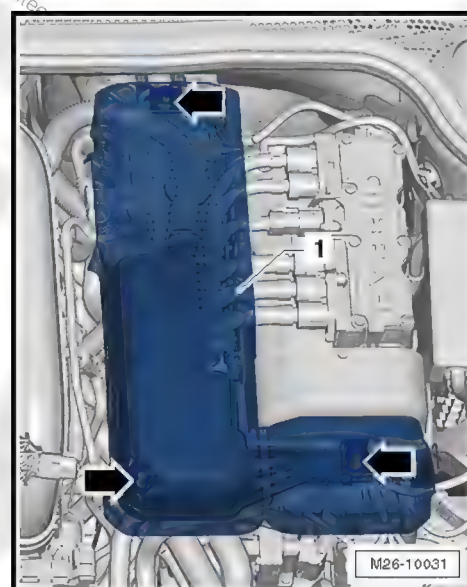
◆ Camshaft Lock -T10494-



◆ Ring Spanner AF30 -T10499A-



Removing

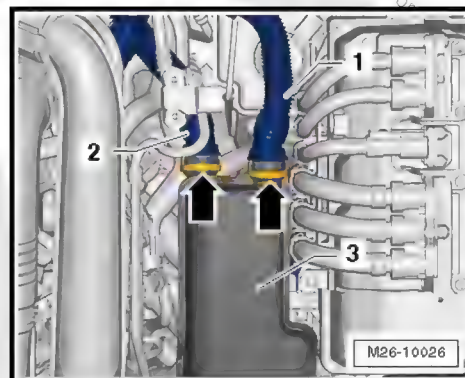


- Unclip and remove the cover -1- upward from the retainers -arrows-.

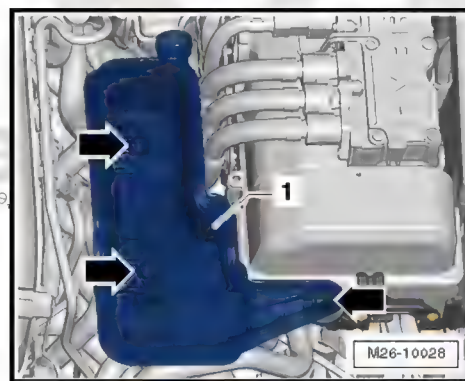




## Vehicles with Secondary Air System



- Disconnect the air line -1 and 2- from the damper -3-. To do so, press the locking rings -arrows- together on both sides and disconnect the lines.
- Remove the damper -1- upward from the rubber bushings -arrows-.



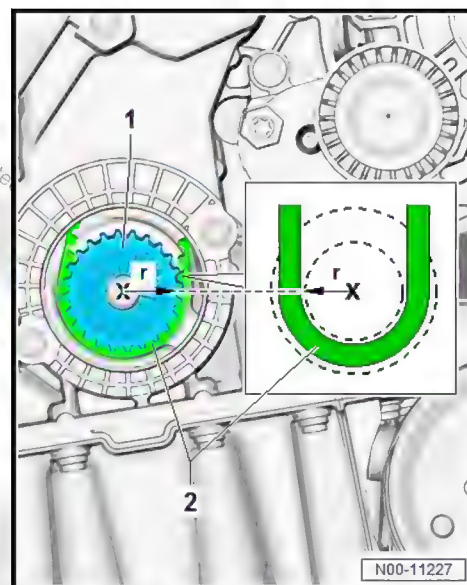
- Separate the air connection line from the connection.

### Continuation for All Vehicles

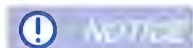
- Remove the engine cover. Refer to ⇒ [C3.1 over, Removing and Installing](#), page 106 .
- Remove the resonator for the intake air scoop. Refer to ⇒ [A2.3 ir Scoop Resonator, Removing and Installing](#), page 371 .
- Remove the air duct pipe. Refer to ⇒ [D2.5 uct Pipe, Removing and Installing](#), page 355 .
- Position the engine in the "TDC position for cylinder 1". Refer to ⇒ [T2.5 iming, Checking](#), page 177 .
- Remove the toothed belt from the camshafts. Refer to ⇒ [B2.7 elt, Removing from Camshafts](#), page 193 .
- Remove the vibration damper. Refer to ⇒ [D1.2 amper, Removing and Installing](#), page 109 .
- Remove the lower toothed belt guard. Refer to ⇒ [T2.3.2 oothed Belt Guard, Removing and Installing](#), page 169 .

Before removing the toothed belt, mark the running direction with chalk or a felt-tip pen for installation later.

### Toothed Belt Bending Radius

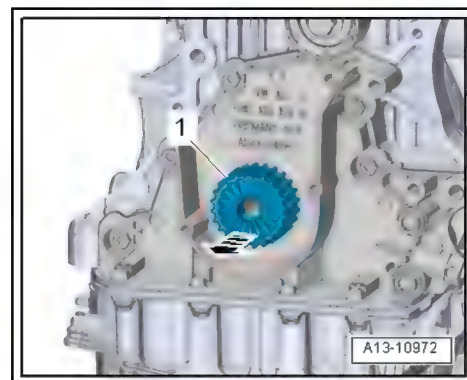
**Note**

- ◆ *There is a risk of destroying the toothed belt by bending too sharply. The toothed belt is made out of a fiberglass cord webbing, that can be damaged by bending too sharply.*
- ◆ *Never bend the toothed belt with a radius less than 25 mm.*
- The bend radius -r- on the toothed belt -2- must for this reason not be under 25 mm (approximately half the diameter of the toothed belt -1- on the crankshaft).
- Remove the toothed belt.



**Risk of destroying the engine by adjusting the valve timing.**

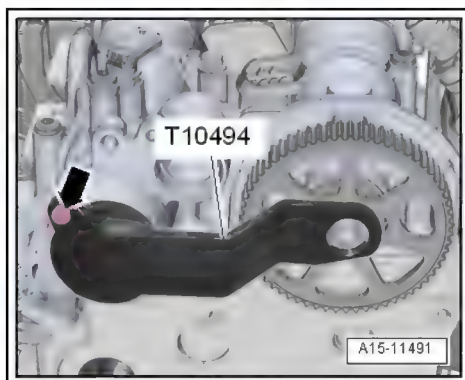
- Do not turn the crankshaft out of TDC.
- Remove the crankshaft toothed belt sprocket -1- in direction of -arrow-.

**Installing**

- Replace the bolts that were tightened with an additional turn.
- Replace the seal for the plug if it is damaged.
- Check the "TDC" position of the camshaft and crankshaft.  
Refer to [⇒ T2.5 Timing, Checking, page 177](#).

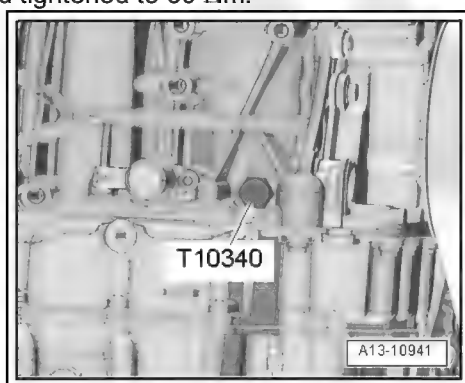


- Attach the Camshaft Lock -T10494- to the camshaft housing.

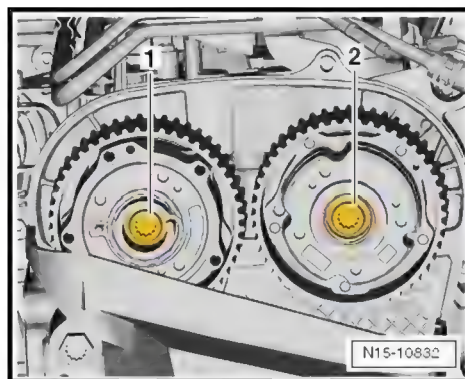


#### Note

- ◆ *There is a risk of damaging the camshaft if handled incorrectly.*
- ◆ *Never use the camshaft positioning tool as a counterholder.*
- Crankshaft Locking Pin -T10340- installed all the way into the cylinder block and tightened to 30 Nm.

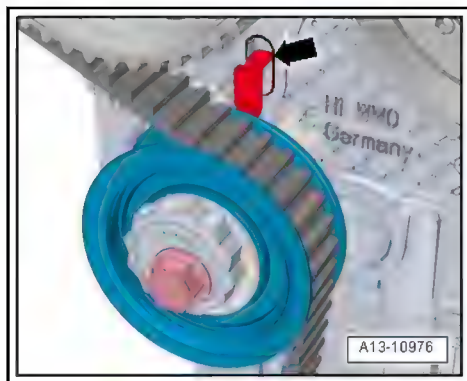


- Crankshaft in direction of engine rotation touching the Crankshaft Locking Pin -T10340- = "TDC" position.
- Replace the bolts -1 and 2- for the camshaft sprockets and install them loosely.

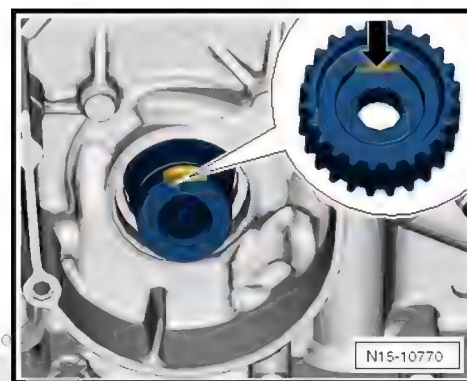


- The camshaft sprockets must still turn on the camshafts and may not tip.
- The metal tab -arrow- on the tensioning roller must fit into the cast depression in the cylinder head.



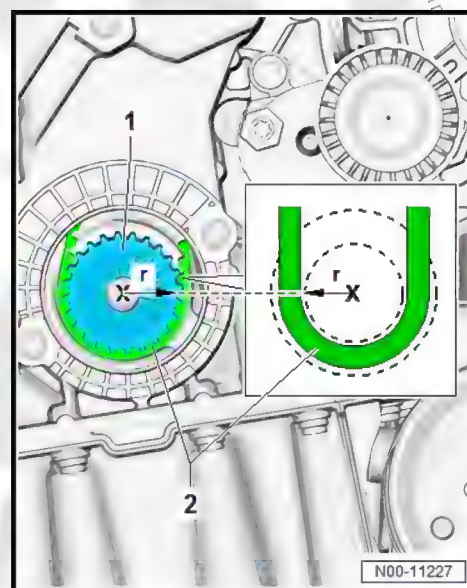


- Mount the crankshaft toothed belt sprocket on the crankshaft.



- The contact surface between the vibration damper and the crankshaft toothed belt sprocket must not have any oil or grease on it.
- The milled surface -arrow- on the crankshaft toothed belt sprocket must fit on the milled surface on the crankcase pin.

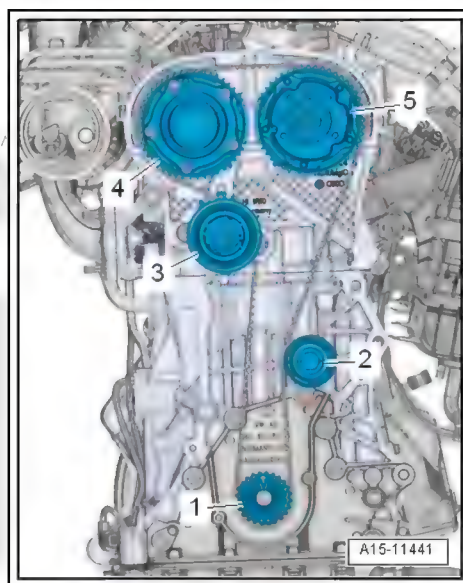
#### Toothed Belt Bending Radius





## Note

- ◆ *There is a risk of destroying the toothed belt by bending too sharply. The toothed belt is made out of a fiberglass cord webbing, that can be damaged by bending to sharply.*
- ◆ *Never bend the toothed belt with a radius less than 25 mm.*
- The bend radius -r- on the toothed belt -2- must for this reason not be under 25 mm (approximately half the diameter of the toothed belt -1- on the crankshaft).
- Mount the toothed belt in the following sequence.



1 - Crankshaft Toothed Belt Sprocket

5 - Idler Roller

2 - Tensioning Roller

3 - Exhaust Side Camshaft Sprocket

4 - Intake Side Camshaft Sprocket with Camshaft Adjuster

- Install the lower toothed belt guard. Refer to ⇒ [T2.3.2 Toothed Belt Guard, Removing and Installing](#), page 169 .
- Install the vibration damper. Refer to ⇒ [D1.2 damper, Removing and Installing](#), page 109 .
- Adjust the valve timing. Refer to ⇒ [T2.6 Timing, Adjusting](#), page 184 .

Further assembly is performed in reverse order.

## Tightening Specifications

- ◆ Refer to ⇒ [-2.1 Toothed Belt Guard](#), page 165
- ◆ Refer to ⇒ [-2.2 Toothed Belt](#), page 165
- ◆ Refer to ⇒ [Fig. ""Plug for TDC Hole in Cylinder Block - Tightening Specification""](#), page 167
- ◆ Refer to ⇒ [-1.2 Camshaft Housing](#), page 149
- ◆ Refer to ⇒ [-3.1 Crankcase Ventilation](#), page 258
- ◆ Refer to ⇒ [-2.1 Coolant Pump/Coolant Thermostat](#), page 285

- ◆ Refer to ⇒ [-1.1 Turbocharger](#)", page 327
- ◆ Refer to ⇒ [-2.1 Charge Air System](#)", page 345
- ◆ Overview - Noise Insulation. Refer to ⇒ Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation.

## 2.5 Valve Timing, Checking

Special tools and workshop equipment required

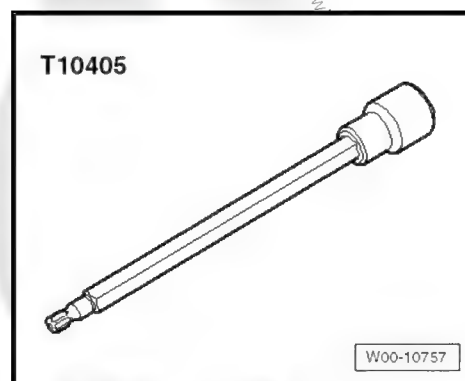
- ◆ Electronic Torque Wrench 3-60Nm -VAS 6583-



- ◆ Crankshaft Locking Pin -T10340-



- ◆ Socket T30 -T10405-





◆ Assembly Tool -T10487-



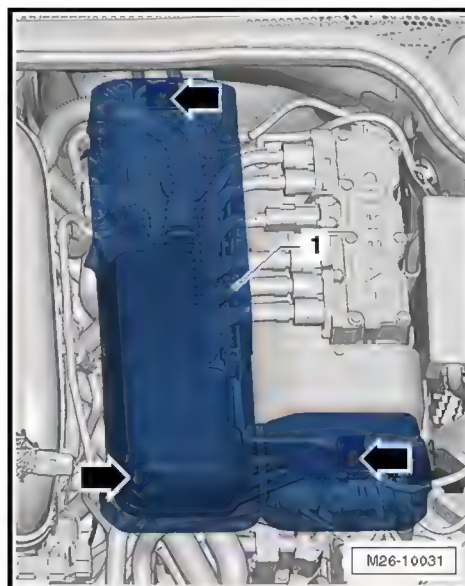
◆ Camshaft Lock -T10494-



Note

- ◆ This procedure also shows the engine at "TDC position for cylinder 1".
- ◆ The valve timing is checked using the Camshaft Lock -T10494-.

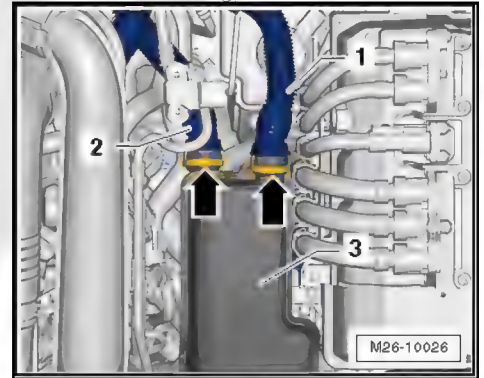
Procedure



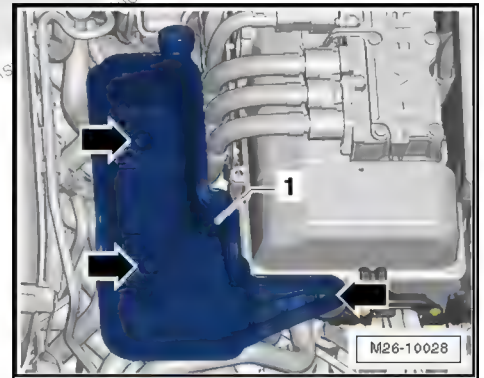
- Unclip and remove the cover -1- upward from the retainers -arrows-.



## Vehicles with Secondary Air System



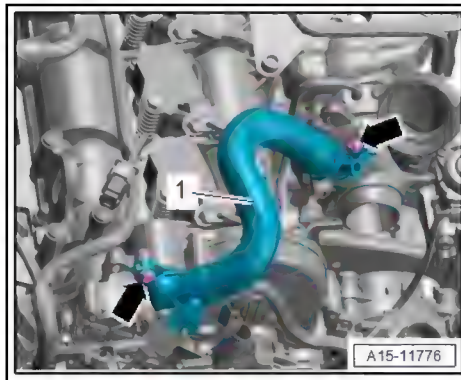
- Disconnect the air line -1 and 2- from the damper -3-. To do so, press the locking rings -arrows- together on both sides and disconnect the lines.
- Remove the damper -1- upward from the rubber bushings -arrows-.



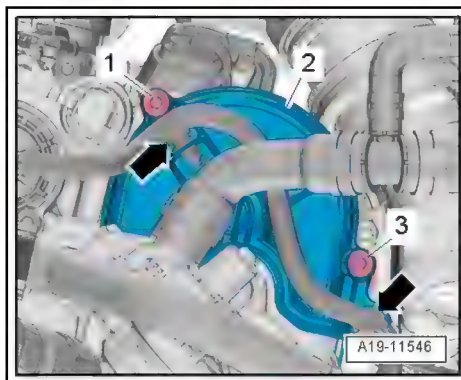
- Separate the air connection line from the connection.

### Continuation for All Vehicles

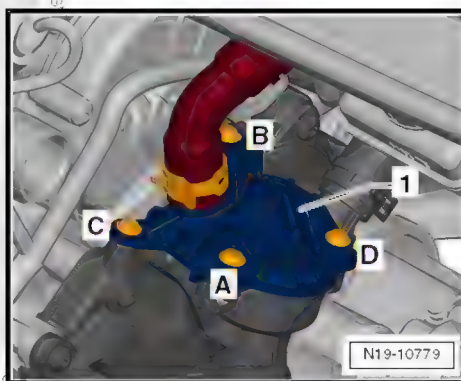
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation.
- Remove the resonator for the intake air scoop. Refer to ⇒ [A2.3 in Scoop Resonator, Removing and Installing](#), page 371 .
- Remove the air duct pipe. Refer to ⇒ [D2.5 uct Pipe, Removing and Installing](#), page 355 .
- Push the release button and remove the hose -1- from the EVAP canister.
- Remove the bolts -arrows- and then remove the crankcase ventilation hose -1-.



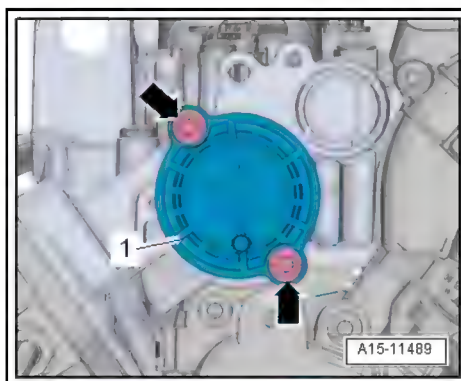
- Free up the wiring harness -arrows-.



- Remove the bolts -1 and 3- and remove the toothed belt guard -2- for the coolant pump toothed belt.
- Remove the bolts -A through D- and move the coolant thermostat cover -1- to the side.



- Remove the bolts -arrows- and the cover -1-.



**Note**

*Risk of chemical damage to the coolant pump seal from oil entry between the coolant pump and the cylinder head.*

- Cover the coolant pump with a clean cloth to catch escaping oil.
- Drain the coolant. Refer to [⇒ D1.3 draining and Filling", page 275](#).

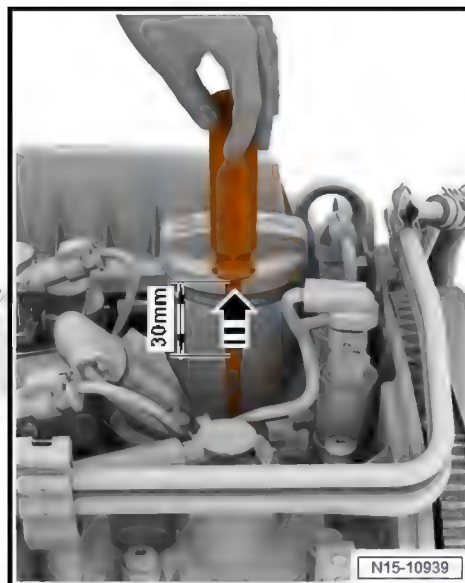
**Turn the Crankshaft to "TDC" as Follows**



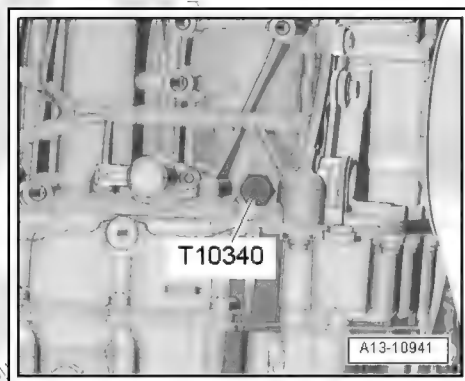
- Remove the Ignition Coil 1 with Power Output Stage -N70- and the cylinder 1 spark plug. Refer to [⇒ -1.1 Ignition System", page 429](#).
- Insert a screwdriver with a shaft length of at least 250 mm into the spark plug shaft until it rests on the piston crown.
- Turn the crankshaft in the direction of engine rotation until the cylinder 1 piston is in "BDC".

The screwdriver moves in the direction of -arrow- during this.

- Continue turning the crankshaft in the direction of engine rotation until the screwdriver has moved -30 mm- in the direction of -arrow-.



- Remove the plug for the “TDC” hole in the cylinder block.



- Install the Crankshaft Locking Pin -T10340- all the way into the cylinder block and tighten to 30 Nm.
- Turn the crankshaft all the way in direction of engine rotation.
- The locking pin is touching the crankshaft counterweight.



#### Note

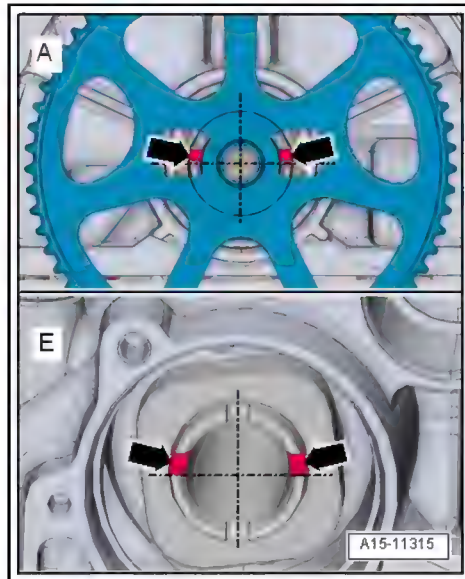
*The Crankshaft Locking Pin -T10340- locks the crankshaft only in direction of engine rotation.*

#### There is a Risk of Damaging the Engine.

- If the Crankshaft Locking Pin -T10340- cannot be installed all the way, then the crankshaft is not in the correct position.
- In this case, proceed as follows:
- Remove the locking pin.
- Turn the crankshaft 90° in the direction of engine rotation.
- Install the Crankshaft Locking Pin -T10340- all the way into the cylinder block and tighten to 30 Nm.
- Continue to turn the crankshaft in the direction of engine rotation until it stops.



- The asymmetrical grooves -upper arrows- on the transmission side on both camshafts must now face upward.
- The grooves -arrows- on the exhaust camshaft -A- are accessible through the holes in the drive wheel for the coolant pump.



- The grooves -arrows- on the intake camshaft -E- are above the center of the camshaft.

A - Exhaust Camshaft

E - Intake Camshaft

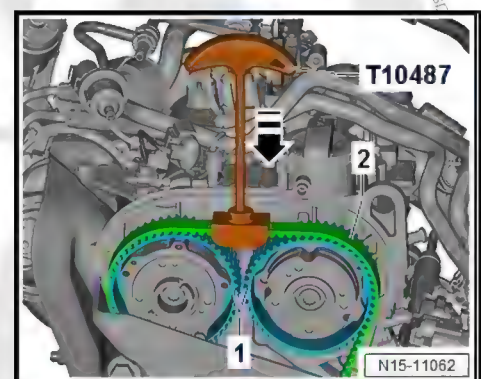
- If the camshafts are not positioned as described, remove the Crankshaft Locking Pin -T10340- and turn the crankshaft one turn farther and back to "TDC".



#### Note

- ◆ It must be easy to insert the Camshaft Lock -T10494-.
- ◆ Do not use a hammer to install the camshaft positioning tool.

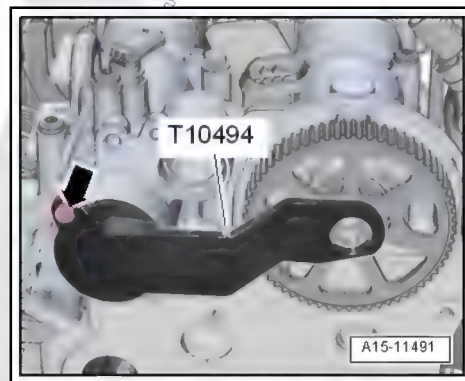
If the Camshaft Lock -T10494- cannot be inserted easily:



- Remove the upper toothed belt guard. Refer to [T2.3.1 Toothed Belt Guard, Removing and Installing](#), page 168 .
- Use the Assembly Tool -T10487- to push on the toothed belt in the direction of -arrow-.



- While doing so, insert the Camshaft Lock -T10494- all the way into the camshafts.



- Tighten the bolt -arrow- hand-tight.

If it is not easy to install the camshaft locating tool:

Adjust the valve timing. Refer to [⇒ T2.6 Timing, Adjusting](#), page 184 .

If it is easy to install the camshaft locating tool:

- The valve timing is OK.

**There is a Risk of Damaging the Engine.**

- Make sure that the Crankshaft Locking Pin -T10340- and the Camshaft Lock -T10494- are removed after completing the work.

Further assembly is performed in reverse order.

- Replace the bolts that were tightened with an additional turn.
- Replace the seal for the plug if it is damaged.

#### **Tightening Specifications**

- ◆ Refer to [⇒ -2.2 Toothed Belt](#), page 165
- ◆ Refer to [⇒ Fig. ““Plug for TDC Hole in Cylinder Block - Tightening Specification””, page 167](#)
- ◆ Refer to [⇒ -1.1.3 Lines on Turbocharger](#), page 329
- ◆ Refer to [⇒ -1.2 Camshaft Housing](#), page 149
- ◆ Refer to [⇒ -2.1 Coolant Pump/Coolant Thermostat](#), page 285
- ◆ Refer to [⇒ -2.1 Charge Air System](#), page 345

## **2.6 Valve Timing, Adjusting**



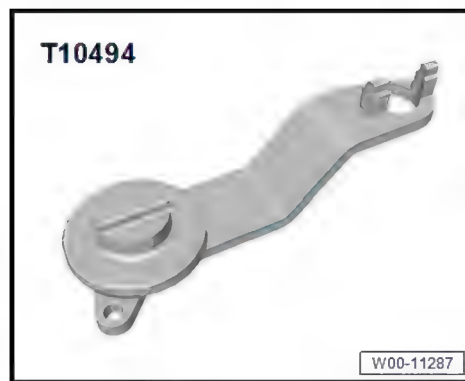
**Special tools and workshop equipment required**



- ◆ Electronic Torque Wrench 3-60Nm -VA S 6583-
- ◆ Counterhold - Multiple Use -T10172A- with Adapter - T10172/1-
- ◆ Crankshaft Locking Pin -T10340-
- ◆ Counterhold - Pulley -T10475-
- ◆ Wrench - Open Ring - 30mm -T10499-
- ◆ Insert Tool - 13mm -T10500-



◆ Camshaft Lock -T10494-



◆ Assembly Tool -T10487-



◆ Ring Spanner AF30 -T10499A-



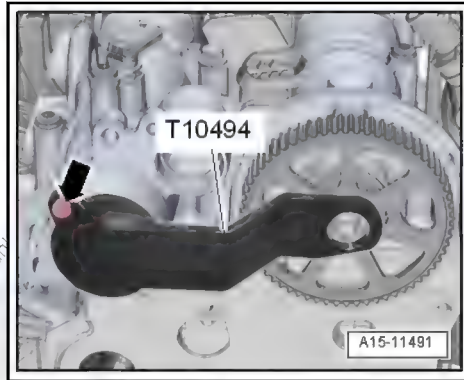
Procedure

- Position the engine in the “TDC position for cylinder 1”. Refer to ➤ [T2.5 Timing, Checking](#), page 177 .
- Remove the toothed belt from the camshafts. Refer to ➤ [B2.7 elt, Removing from Camshafts](#), page 193 .

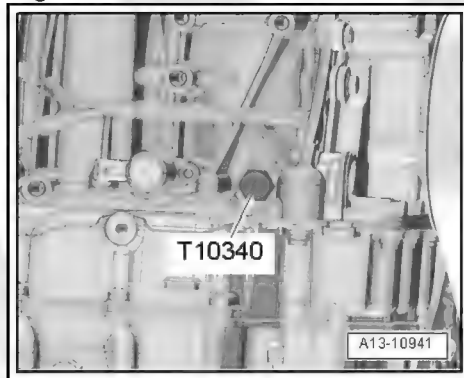
Valve Timing, Adjusting

- Replace the bolts that were tightened with an additional turn.
- Replace the seal for the plug if it is damaged.
- Check the “TDC” position of the camshaft and crankshaft:
- Attach the Camshaft Lock -T10494- to the camshaft housing.





- Crankshaft Locking Pin -T10340- installed all the way into the cylinder block and tightened to 30 Nm.

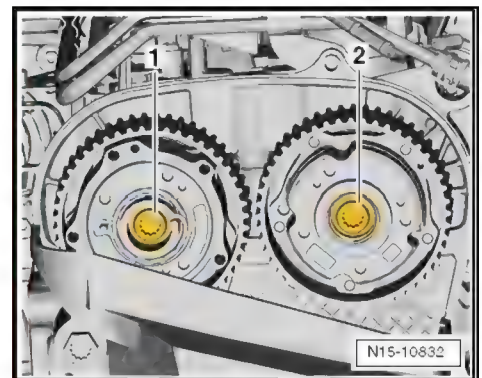


- Crankshaft in direction of engine rotation touching the Crankshaft Locking Pin -T10340- = "TDC" position.

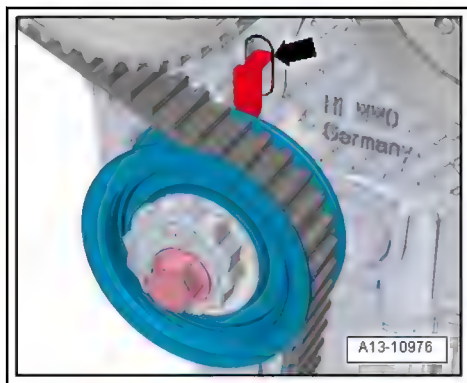


**Risk of destroying the engine by adjusting the valve timing.**

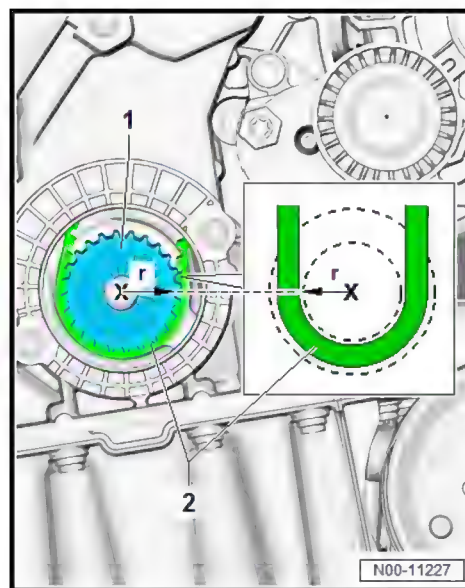
- Do not turn the crankshaft out of TDC.
- Replace the bolts -1 and 2- for the camshaft sprockets and install them loosely. Refer to ➔ [C3.4.1 camshaft Adjuster, Removing and Installing](#), page 211 .



- The camshaft sprockets must still turn on the camshafts and may not tip.
- The metal tab -arrow- on the tensioning roller must fit into the cast depression in the cylinder head.



### Toothed Belt Bending Radius



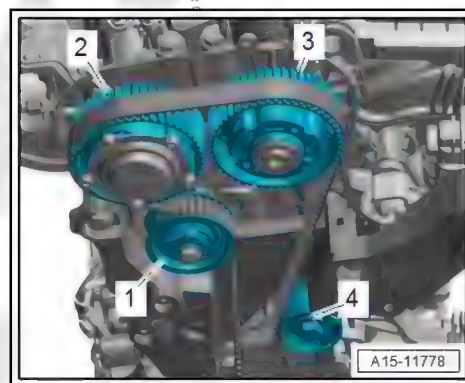
#### ! NOTICE

There is a risk of destroying the toothed belt by bending too sharply. The toothed belt is made out of a fiberglass cord webbing, that can be damaged by bending to sharply.

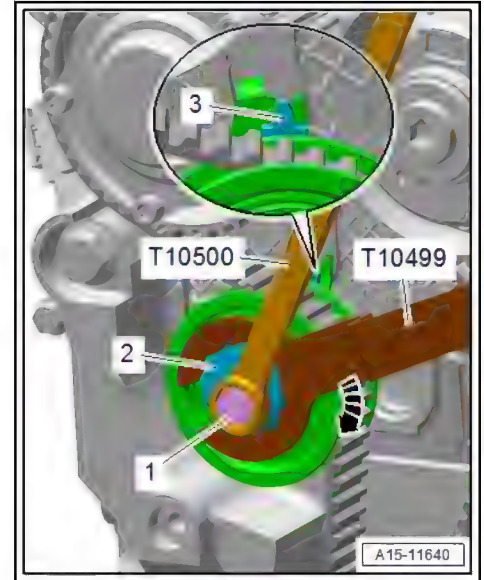
– Never bend the toothed belt with a radius less than 25 mm.

- The bend radius -r- on the toothed belt -2- must for this reason not be under 25 mm (approximately half the diameter of the toothed belt -1- on the crankshaft).

Follow the Sequence when Installing the Toothed Belt



- Pull the toothed belt upward and route it over the idler roller -4-, the tensioning roller -1- and the camshaft sprockets -2 and 3-.
- Turn the tensioning roller eccentric pulley -2- in the direction of -arrow- using the Ring Spanner AF30 -T10499A- until the pointer -3- is approximately 10 mm to the right of the setting window.



- Turn back the eccentric pulley so that the pointer is exactly inside the setting window.

**Note**

- ◆ *The Electronic Torque Wrench 3-60Nm -VAS 6583- must be used to tighten.*
- ◆ *When adjusting the tightening specification on the Electronic Torque Wrench 3-60Nm -VAS 6583- the specified actual dimension must be entered on the Insert Tool - 13mm -T10500- in the torque wrench.*
- Hold the eccentric pulley in this position.
- Tighten the bolt -1-.
- Use the Insert Tool - 13mm -T10500- with Electronic Torque Wrench 3-60Nm -VAS 6583- to do this.

**Note**

- ◆ *If the engine is turned further or is run, the position of the pointer -3- in the setting window may differ slightly. This difference does not have any influence on the toothed belt tension and the valve timing.*
- ◆ *The bolts must first be tightened to the final tightening specification (additional turn) once the valve timing has been checked and is OK.*
- Tighten the bolts for the camshaft adjuster to the pre-tightening specification. Refer to [⇒ page 215](#).



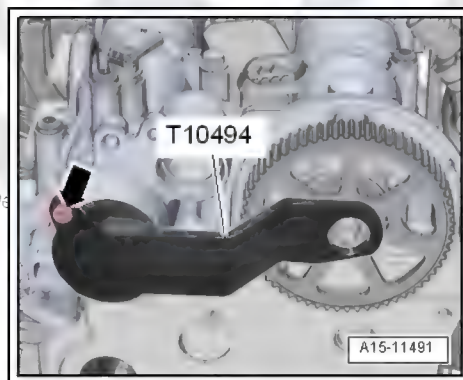
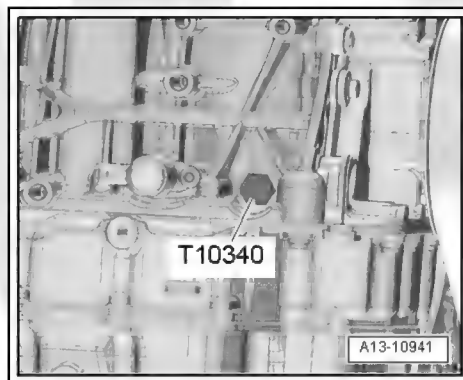


**NOTICE**

There is a risk of damaging the camshaft if handled incorrectly.

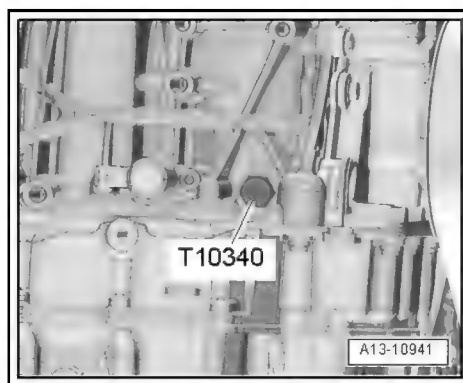
- Never use the camshaft positioning tool as a counterholder.
- Remove the Crankshaft Locking Pin -T10340-

- Remove the bolt -arrow- and remove the Camshaft Lock -T10494-.



### Checking Valve Timing after Adjusting

- Turn the crankshaft two turns in direction of engine rotation.
- Install the Crankshaft Locking Pin -T10340- all the way into the cylinder block and tighten to 30 Nm.
- Turn the crankshaft farther all the way in direction of engine rotation.
- The locking pin is touching the crankshaft counterweight.





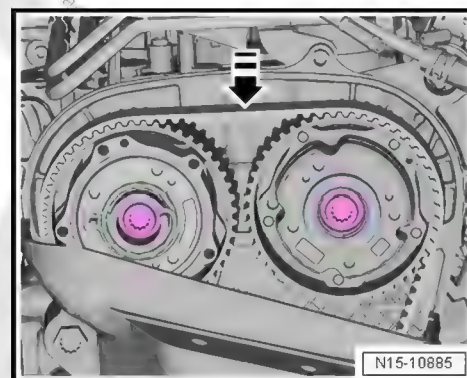


## Note

- ◆ The Crankshaft Locking Pin -T10340- locks the crankshaft only in direction of engine rotation.
- ◆ It must be easy to insert the Camshaft Lock -T10494-.
- ◆ Do not use a hammer to install the camshaft positioning tool.

If the Camshaft Lock -T10494- cannot be inserted easily:

- Use the Assembly Tool -T10487- to push on the toothed belt in the direction of -arrow-.



- Insert the Camshaft Lock -T10494- all the way in the camshafts.



- Tighten the bolt -arrow- hand-tight.

If the Camshaft Lock -T10494- cannot be inserted, then the valve timing is not OK:

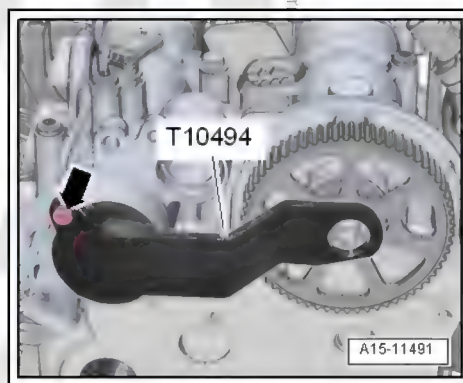
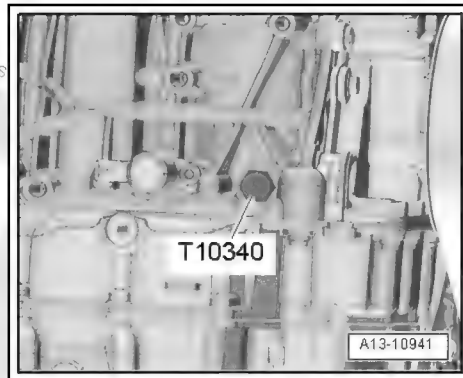
- Adjust the valve timing again. Refer to ⇒ [page 186](#) .

If the Camshaft Lock -T10494- can be inserted, then the valve timing is OK.

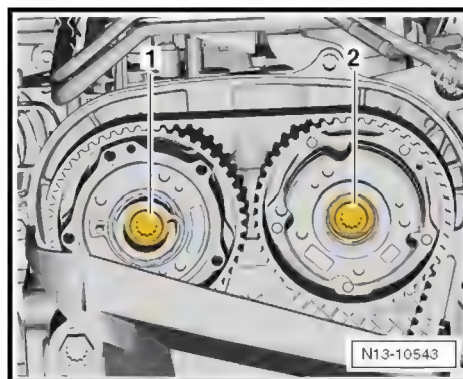
- Remove the Crankshaft Locking Pin -T10340-.



- Remove the bolt -arrow- and remove the Camshaft Lock -T10494-.



- Tighten the bolts -1 and 2- to the tightening specification. Refer to ➔ [page 215](#).



**There is a Risk of Damaging the Engine.**

- ◆ Make sure the Crankshaft Locking Pin -T10340- and the Camshaft Lock -T10494- are removed after completing the work.

Further assembly is performed in reverse order.

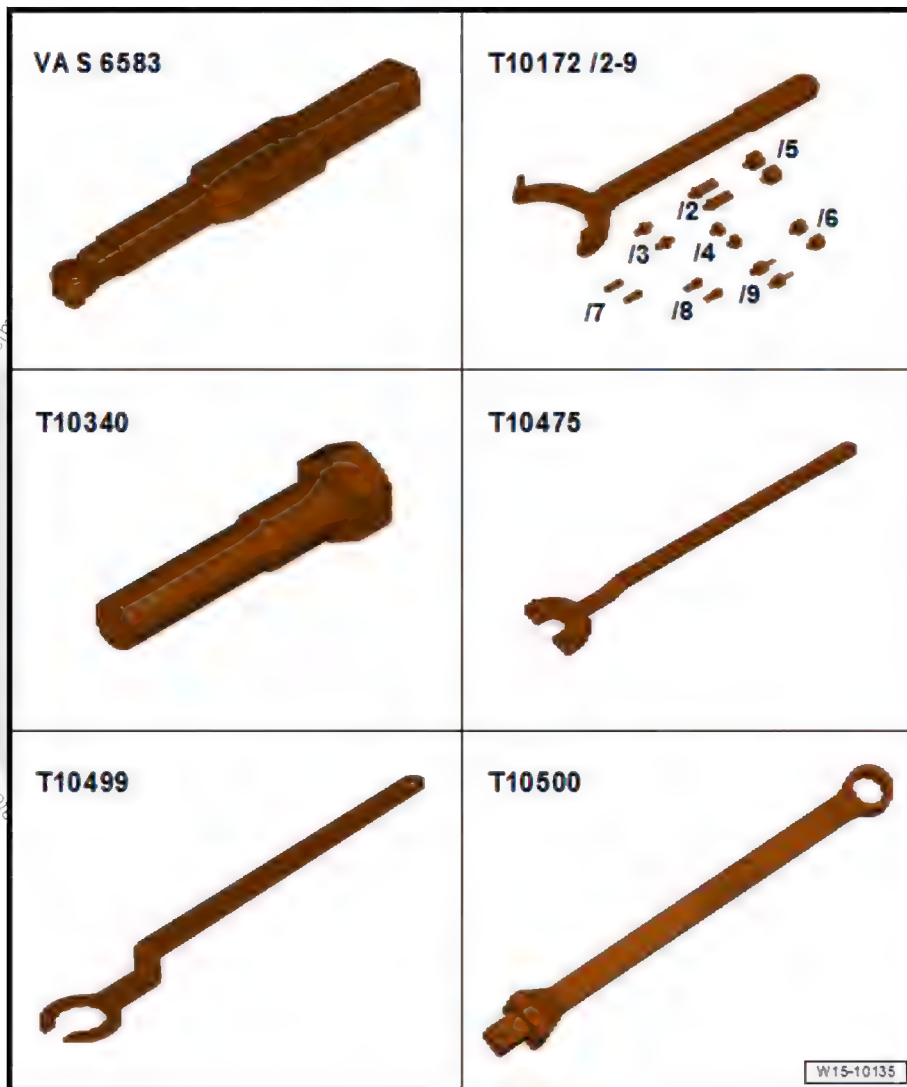
#### **Tightening Specifications**

- ◆ Refer to ➔ [-2.1 Toothed Belt Guard](#), [page 165](#)
- ◆ Refer to ➔ [-2.2 Toothed Belt](#), [page 165](#)
- ◆ Refer to ➔ [Fig. "Plug for TDC Hole in Cylinder Block - Tightening Specification"](#), [page 167](#)
- ◆ Refer to ➔ [-1.2 Camshaft Housing](#), [page 149](#)
- ◆ Refer to ➔ [-3.1 Crankcase Ventilation](#), [page 258](#)

- ◆ Refer to ➤ [-1.1 Turbocharger](#)", page 327
- ◆ Refer to ➤ [-2.1 Charge Air System](#)", page 345

## 2.7 Toothed Belt, Removing from Camshafts

Special tools and workshop equipment required



- ◆ Electronic Torque Wrench 3-60Nm -VAS 6583-
- ◆ Counterhold - Multiple Use -T10172A-
- ◆ Crankshaft Locking Pin -T10340-
- ◆ Counterhold - Pulley -T10475-
- ◆ Wrench - Open Ring - 30mm -T10499-
- ◆ Insert Tool - 13mm -T10500-



◆ Assembly Tool -T10487-



◆ Camshaft Lock -T10494-



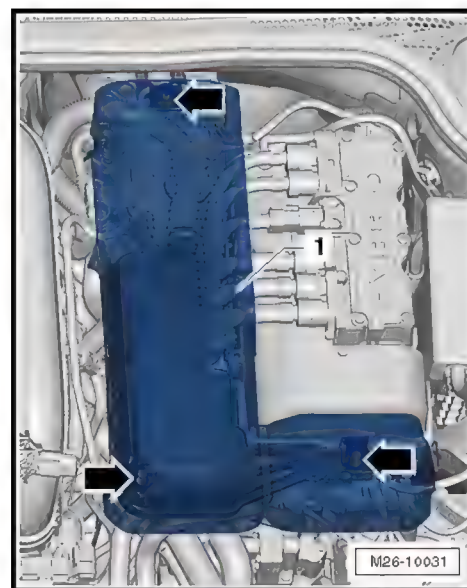
◆ Ring Spanner AF30 -T10499A-





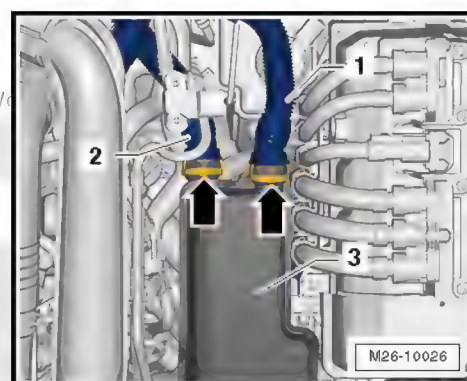


## Removing

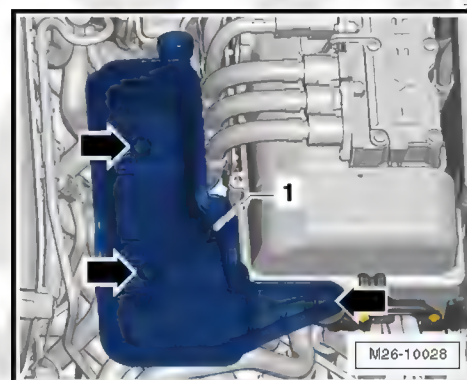


- Unclip and remove the cover -1- upward from the retainers -arrows-.

## Vehicles with Secondary Air System



- Disconnect the air line -1 and 2- from the damper -3-. To do so, press the locking rings -arrows- together on both sides and disconnect the lines.
- Remove the damper -1- upward from the rubber bushings -arrows-.

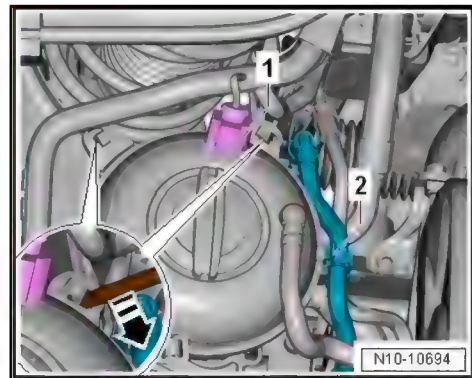


- Separate the air connection line from the connection.

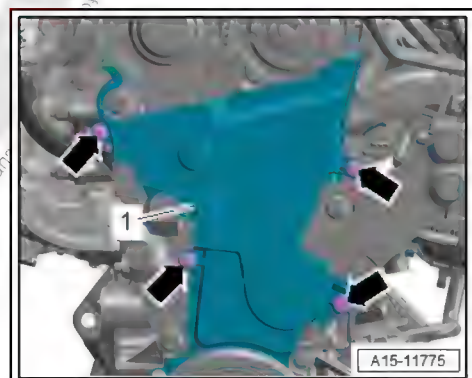


### Continuation for All Vehicles

- Remove the noise insulation. Refer to ➤ Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation.
- Remove the resonator for the intake air scoop. Refer to ➤ [A2.3 ir Scoop Resonator, Removing and Installing](#), page 371 .
- Remove the air duct pipe. Refer to ➤ [D2.5 uct Pipe, Removing and Installing](#), page 355 .
- Release and disconnect the connector -1-.



- Free up the lines -2- on the coolant expansion tank.
- Release the retainers with a screwdriver in direction of -arrow- and move the coolant expansion tank to the side.
- Disconnect the connector couplings from the fuel hose and from the hose to the EVAP canister.
- Remove the upper toothed belt guard. Refer to ➤ [T2.3.1 oothed Belt Guard, Removing and Installing](#), page 168 .
- Position the engine in the "TDC position for cylinder 1". Refer to ➤ [T2.5 iming, Checking](#), page 177 .
- Remove the engine mount. Refer to ➤ [M2.2 ount, Removing and Installing](#), page 74 .
- Remove the bolts -arrows- and push the lower toothed belt guard -1- slightly to the right.

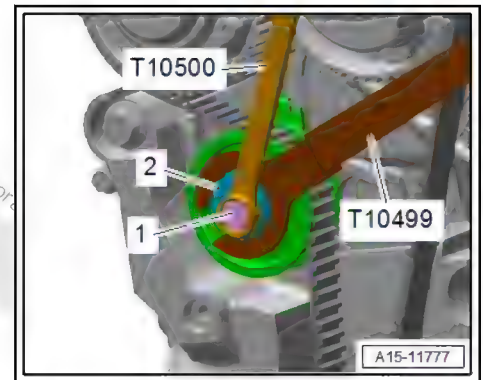


### ! NOTICE

There is a risk of damaging the camshaft if handled incorrectly.

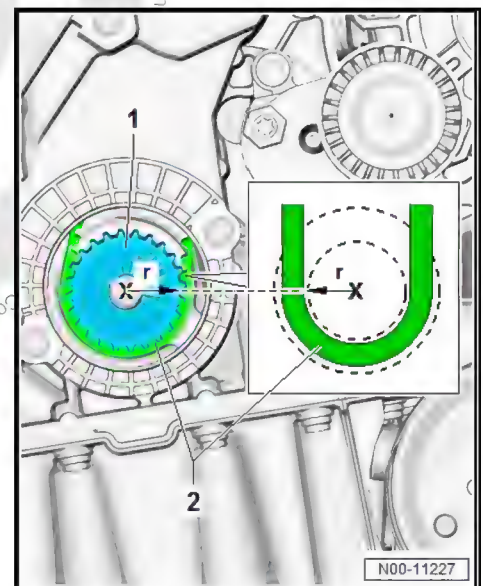
- Never use the camshaft positioning tool as a counterholder.

- If the toothed belt is to be reused, mark the running direction with chalk or a felt-tip pen for reinstallation.
- Place the Ring Spanner AF30 -T10499A- on the tensioning roller eccentric pulley -2-.



- Loosen the bolt -1- with the Insert Tool - 13mm -T10500-.
- Use the Ring Spanner AF30 -T10499A-, release the tension on the tensioning roller at the eccentric pulley -2-.

### Toothed Belt Bending Radius



#### NOTICE

There is a risk of destroying the toothed belt by bending too sharply. The toothed belt is made out of a fiberglass cord webbing, that can be damaged by bending to sharply.

- Never bend the toothed belt with a radius less than 25 mm.
- The bend radius -r- on the toothed belt -2- must for this reason not be under 25 mm (approximately half the diameter of the toothed belt -1- on the crankshaft).
- Remove the toothed belt from the camshaft sprockets.



#### NOTICE

Risk of destroying the engine by adjusting the valve timing.

- Do not turn the crankshaft out of TDC.



## Installing

- Install the toothed belt and adjust valve timing. Refer to ➤ [T2.6 Timing, Adjusting", page 184](#) .

## Tightening Specifications

- ◆ Refer to ➤ [-2.2 Toothed Belt", page 165](#)
- ◆ Refer to ➤ [Fig. "Plug for TDC Hole in Cylinder Block - Tightening Specification", page 167](#)
- ◆ Refer to ➤ [-1.2 Camshaft Housing", page 149](#)
- ◆ Refer to ➤ [-3.1 Crankcase Ventilation", page 258](#)
- ◆ Refer to ➤ [-2.1 Coolant Pump/Coolant Thermostat", page 285](#)
- ◆ Refer to ➤ [-2.1 Charge Air System", page 345](#)
- ◆ Overview - Noise Insulation. Refer to ➤ Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation.







### 3 Valvetrain

⇒ [3.1 Valvetrain", page 199](#)

⇒ [M3.2 Measuring Axial Clearance", page 201](#)

⇒ [S3.3 Seal, Removing and Installing", page 202](#)

⇒ [A3.4 Adjuster, Removing and Installing", page 211](#)

⇒ [C3.5 Camshaft Adjustment Valve 1N205, Removing and Installing", page 223](#)

⇒ [E3.6 Exhaust Camshaft Adjustment Valve 1N318, Removing and Installing", page 223](#)

⇒ [S3.7 Stem Seals, Removing and Installing", page 224](#)

#### 3.1 Overview - Valvetrain



### 1 - Intake Valve

- ☐ Do not rework, only grinding is permitted
- ☐ Valve Dimensions. Refer to ➤ [D4.3 imensions", page 235](#) .
- ☐ Valve Guides, Checking. Refer to ➤ [G4.1 uides, Checking", page 234](#) .

### 2 - Exhaust Valve

- ☐ Do not rework, only grinding is permitted
- ☐ Valve Dimensions. Refer to ➤ [D4.3 imensions", page 235](#) .
- ☐ Valve Guides, Checking. Refer to ➤ [G4.1 uides, Checking", page 234](#) .

### 3 - Cylinder Head

### 4 - Valve Stem Seal

- ☐ Replacing. Refer to ➤ [S3.7 tem Seals, Removing and Installing", page 224](#) .

### 5 - Valve Spring

- ☐ Installation position. Refer to ➤ [Fig. ""Installation Position of Valve Spring", page 200](#) .

### 6 - Valve Spring Retainer

### 7 - Valve Keepers

### 8 - Roller Rocker Lever

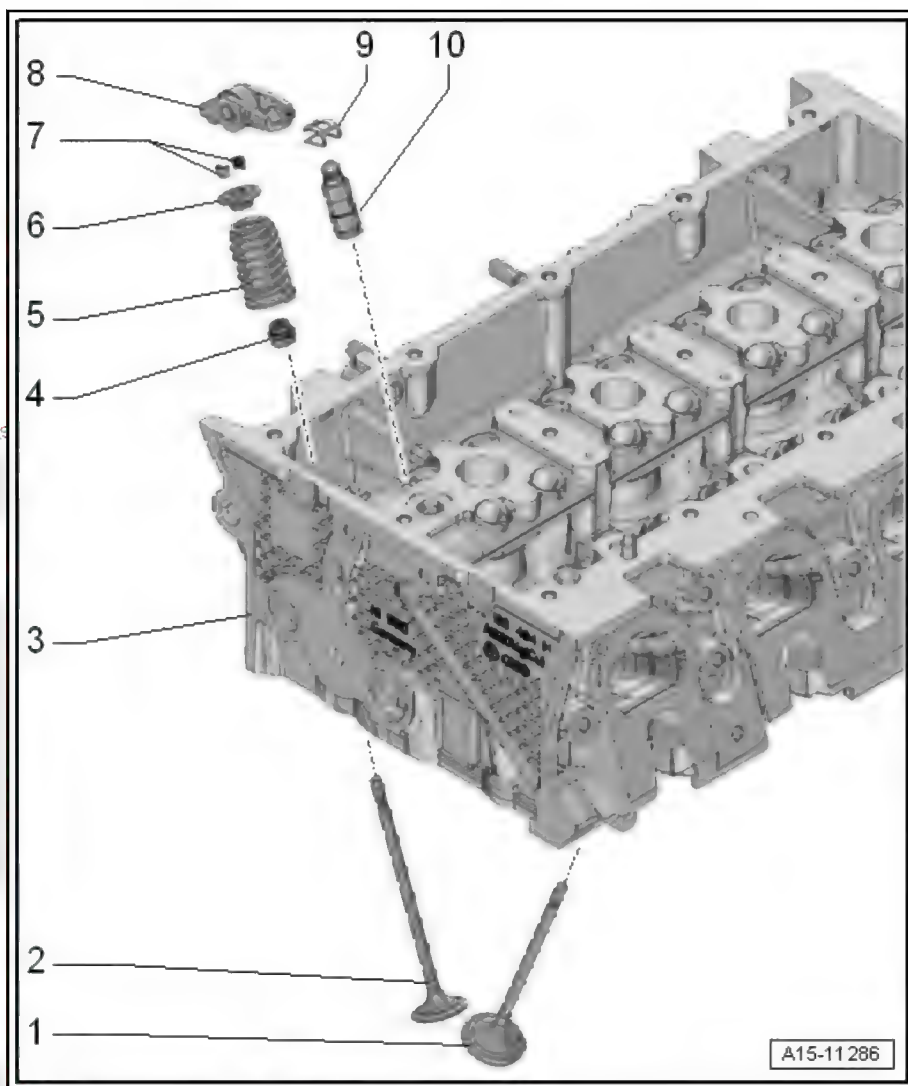
- ☐ Removing and Installing. Refer to ➤ [H1.4 ousing, Removing and Installing", page 157](#) .
- ☐ Mark the installed position for reinstallation.
- ☐ Check the roller bearing for ease of movement
- ☐ Lubricate the running surfaces before installing

### 9 - Clip

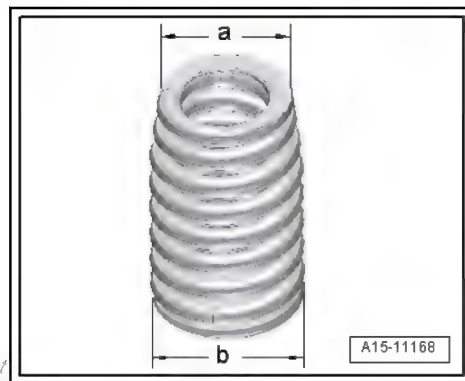
- ☐ For hydraulic lifter

### 10 - Hydraulic Lifter

- ☐ Do not interchange



### Installation Position of Valve Spring



- The small diameter -a- faces the valve spring retainer.
- The larger diameter -b- faces the cylinder head.

### 3.2 Camshaft, Measuring Axial Clearance

Special tools and workshop equipment required

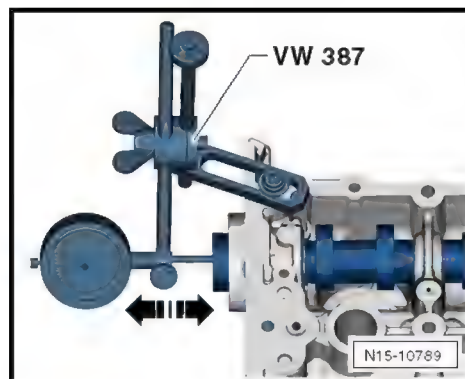
- ◆ Dial Gauge Holder -VW 387-



- ◆ Dial Gauge - 0-10mm -VAS 6079-



#### Procedure





- Remove the camshaft housing. Refer to [⇒ H1.4 ousing, Removing and Installing”, page 157](#) .
- Secure the Dial Gauge - 0-10mm -VAS 6079- on the camshaft housing with the Dial Gauge Holder -VW 387- as shown.
- Press the camshaft against the dial gauge by hand.
- Set the dial gauge to “0”.
- Push the camshaft off the dial gauge and read the value:

Axial clearance:

- Wear limit: 0.25 mm.

### 3.3 Camshaft Seal, Removing and Installing

⇒ [S3.3.1 Seal for Intake Camshaft, Removing and Installing, Belt Pulley Side”, page 202](#)

⇒ [S3.3.2 Seal for Exhaust Camshaft on Belt Pulley Side, Removing and Installing”, page 204](#)

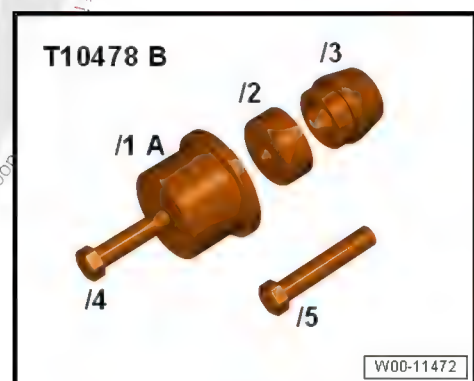
⇒ [C3.3.3 amshaft Seal, Removing and Installing, Transmission Side, Version 1”, page 207](#)

⇒ [C3.3.4 amshaft Seal, Removing and Installing, Transmission Side, Version 2”, page 209](#)

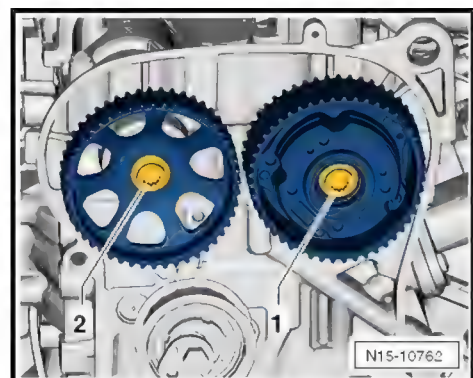
#### 3.3.1 Camshaft Seal for Intake Camshaft, Removing and Installing, Belt Pulley Side

Special tools and workshop equipment required

- ◆ Seal Installer - Camshaft -T10478B-

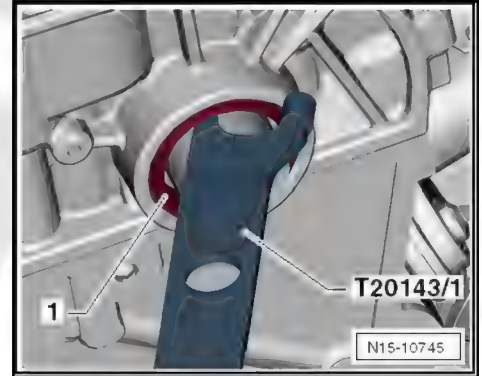


#### Removing





- Remove the toothed belt from the camshafts. Refer to ➤ [B2.7 elt, Removing from Camshafts", page 193](#).
- Remove the bolt -1- and remove the camshaft sprocket.
- Remove the seal -1- using the Puller - Crankshaft/Power Steering Seal -T20143/1-



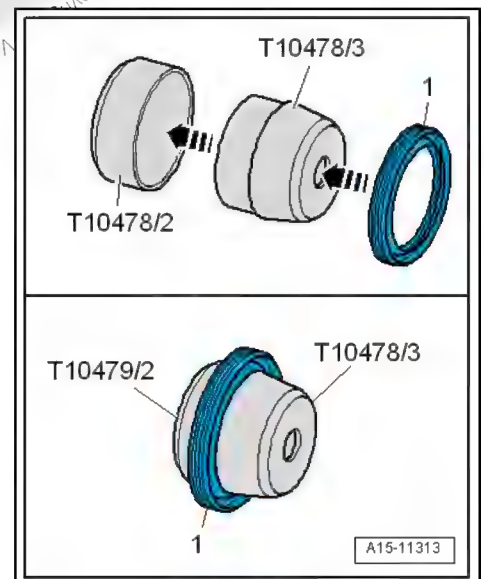
## Installing



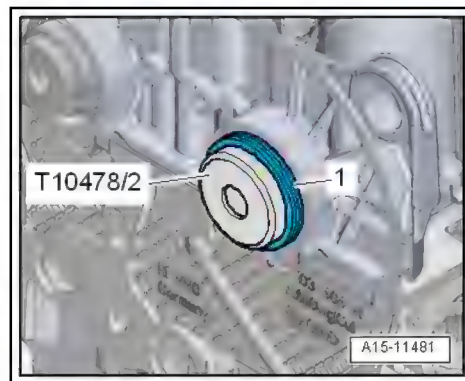
### Note

*Do not coat the new seal with oil.*

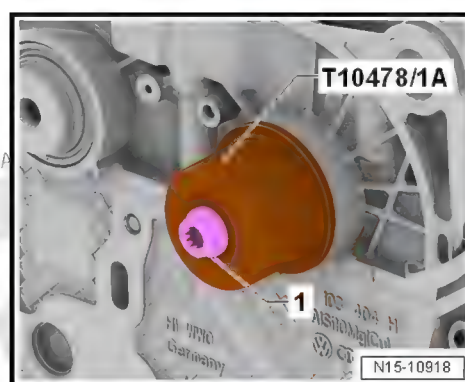
- Slide the seal -1- over the Fitting Sleeve -T10478/3- onto the Guide Sleeve -T10478/2-



- Installed position: the closed side of the seal faces the seal installer.
- Separate the fitting sleeve and guide sleeve.
- Mount the Guide Sleeve -T10478/2- with the seal -1- on the camshaft.



- Install the seal with the seal installer Thrust Piece - Camshaft - T10478/1A- and the bolt -1- for the camshaft sprocket all the way.

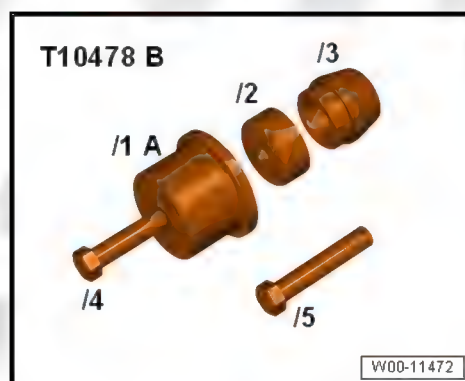


- Install the toothed belt (adjust valve timing). Refer to ➔ [B2.7 elt, Removing from Camshafts, page 193](#).

### 3.3.2 Camshaft Seal for Exhaust Camshaft on Belt Pulley Side, Removing and Installing

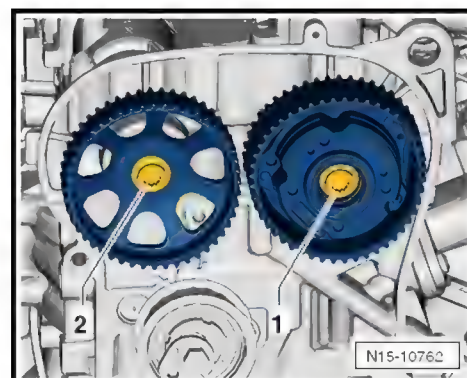
Special tools and workshop equipment required

- ◆ Seal Installer - Camshaft - T10478 B-

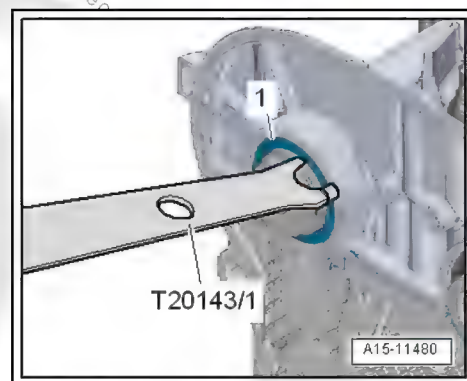




## Removing



- Remove the toothed belt from the camshafts. Refer to ➤ [B2.7 elt, Removing from Camshafts”, page 193](#).
- Remove the bolt -2- and the camshaft sprocket.
- Remove the seal -1- using the Puller - Crankshaft/Power Steering Seal -T20143/1-.



## Installing

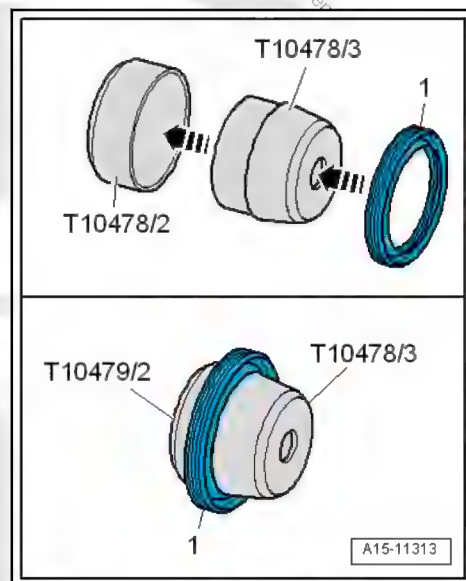


### Note

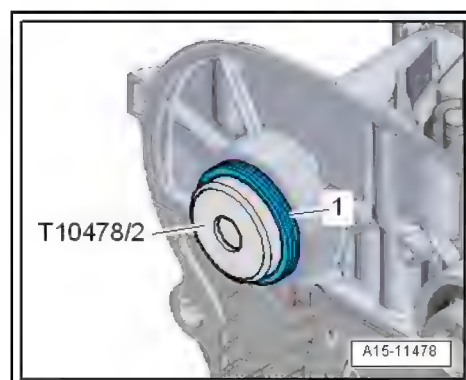
*Do not coat the new seal with oil.*

- Slide the seal -1- over the Fitting Sleeve -T10478/3- onto the Guide Sleeve -T10478/2-.

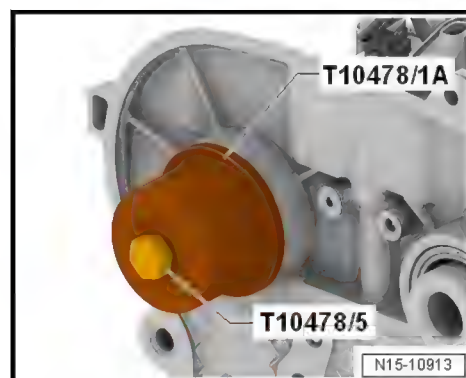




- Installed position: the closed side of the seal faces the seal installer.
- Separate the fitting sleeve and guide sleeve.
- Position the Guide Sleeve -T10478/2- with the seal -1- on the camshaft.



- Install the Seal Installer Thrust Piece - Camshaft - T10478/1A- with the Hexagon Bolt M10x1.25x46 -T10478/5- until it stops.



- Install the toothed belt (adjust valve timing). Refer to ➤ [B2.7 elt, Removing from Camshafts", page 193](#) .

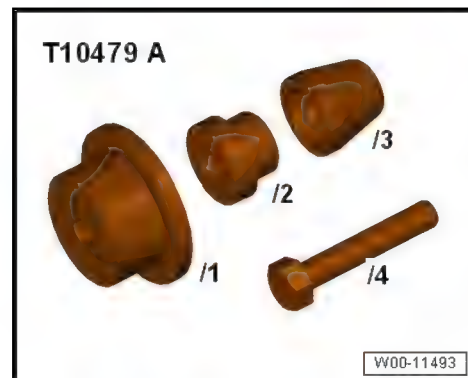




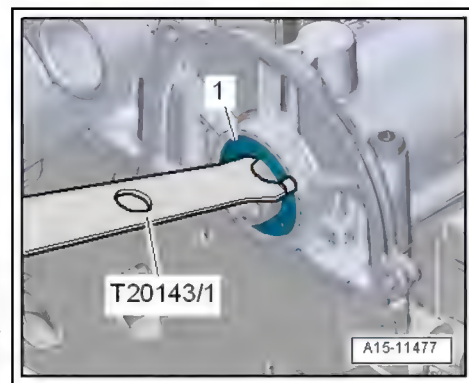
### 3.3.3 Exhaust Camshaft Seal, Removing and Installing, Transmission Side, Version 1

Special tools and workshop equipment required

- ◆ Seal Installer - Camshaft -T10479A-



#### Removing



- Remove the coolant pump toothed belt. Refer to ➔ [P2.7 ump Toothed Belt Sprocket, Removing and Installing](#), page 308.



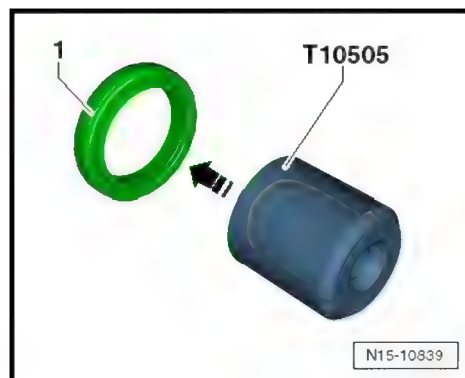
#### Note

*Risk of chemical damage to the coolant pump seal from oil entry between the coolant pump and the cylinder head.*

- Cover the coolant pump with a cloth.
- Insert the Pulling Hook -T20143/1- carefully between the camshaft and seal -1-.
- Remove the seal.



## Installing



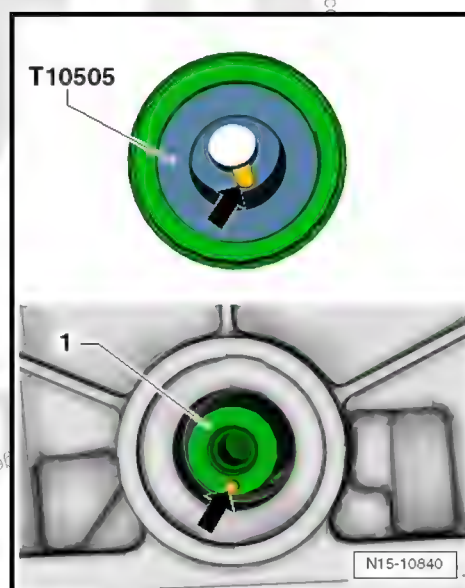
- Slide the Seal Installer - Camshaft O-Ring -T10505- into the seal -1- in the direction of -arrow-.



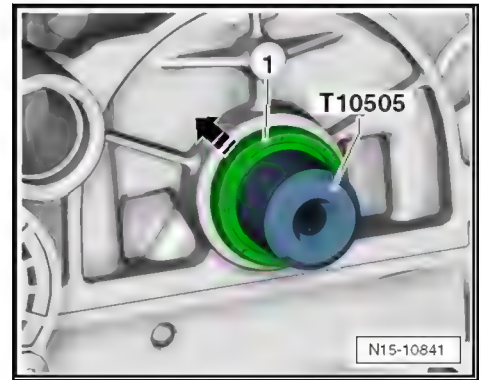
### Note

*Do not coat the new seal with oil.*

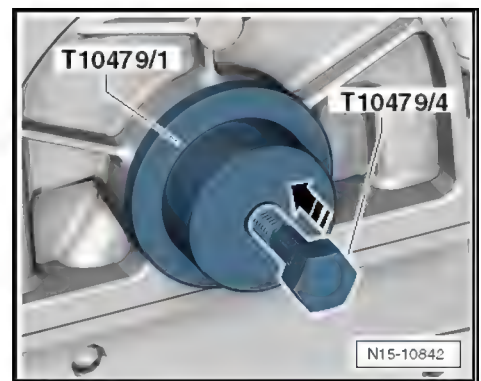
- Installed position: the closed side of the seal faces the thrust piece.
- Mount the Seal Installer - Camshaft O-Ring -T10505- together with the seal on the exhaust camshaft -1-.
- The pin -bottom arrow- on the camshaft must fit into the opening -top arrow- in the thrust piece.



- Push the seal onto the camshaft housing -1- in direction of -arrow-.



- Install the seal using the Thrust Piece -T10479/1- and the Bolt -T10479/4- until it stops.

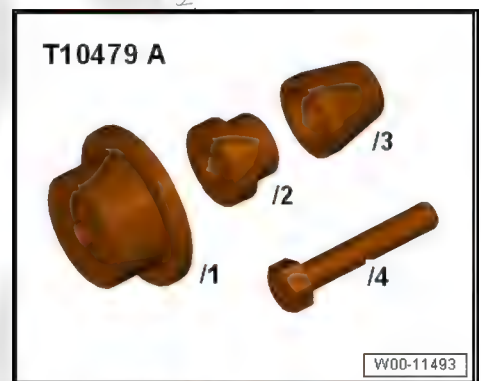


- Install the coolant pump toothed belt. Refer to [P2-7-ump Toothed Belt Sprocket, Removing and Installing](#), page 308.

### 3.3.4 Exhaust Camshaft Seal, Removing and Installing, Transmission Side, Version 2

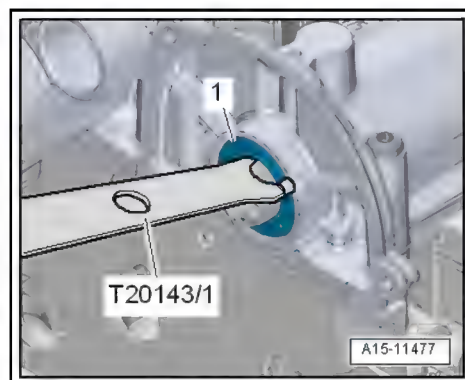
Special tools and workshop equipment required

- ◆ Seal Installer, Camshaft -T10479A-





## Removing



- Remove the coolant pump toothed belt. Refer to ➤ [P2.7 ump Toothed Belt Sprocket, Removing and Installing](#), page 308 .

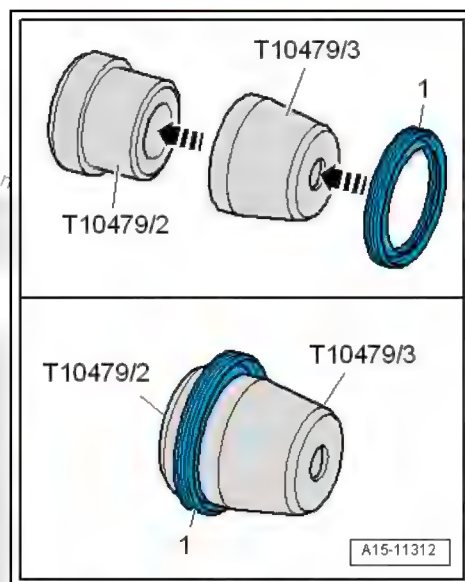


### Note

*Risk of chemical damage to the coolant pump seal from oil entry between the coolant pump and the cylinder head.*

- Cover the coolant pump with a cloth.
- Insert the Pulling Hook -T20143/1- carefully between the camshaft and seal -1-.
- Remove the seal.

## Installing



### Note

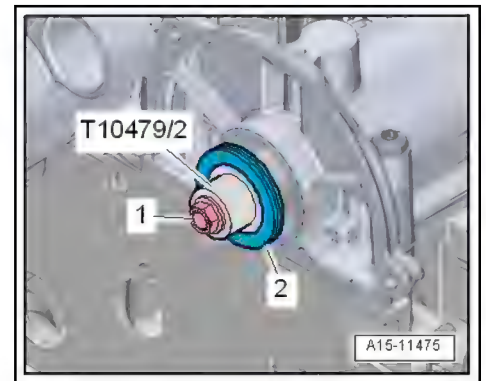
*Do not coat the new seal with oil.*

- Slide the seal -1- over the Sleeve -T10479/3- and onto the Guide Sleeve -T10479/2-.
- Installed position: the closed side of the seal faces the seal installer.

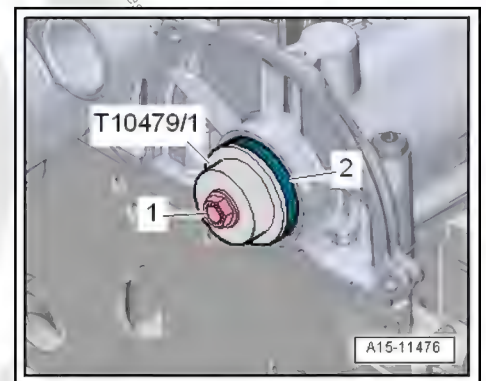




- Separate the fitting sleeve and guide sleeve.
- Position the Guide Sleeve -T10479/2- with the seal -2- in the center on the camshaft.



- Secure the guide sleeve to the camshaft with the coolant pump drive wheel bolt -1-.
- Push the seal onto the camshaft and remove the guide sleeve.
- Install the seal -2- with the Thrust Piece -T10479/1- and the bolt -1- for the coolant pump drive wheel all the way.



- Install the coolant pump toothed belt. Refer to ⇒ [P2.7 ump Toothed Belt Sprocket, Removing and Installing](#), page 308.

### 3.4 Camshaft Adjuster, Removing and Installing

⇒ [C3.4.1 amshaft Adjuster, Removing and Installing](#), page 211

⇒ [C3.4.2 amshaft Adjuster, Removing and Installing](#), page 217

#### 3.4.1 Intake Camshaft Adjuster, Removing and Installing

Special tools and workshop equipment required



◆ Electronic Torque Wrench 3-60Nm -VAS 6583-



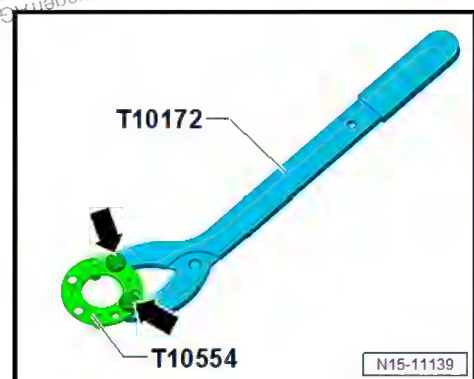
◆ Counterhold - Multiple Use -T10172A-



◆ Counterhold -T10554-



Tool Preparation

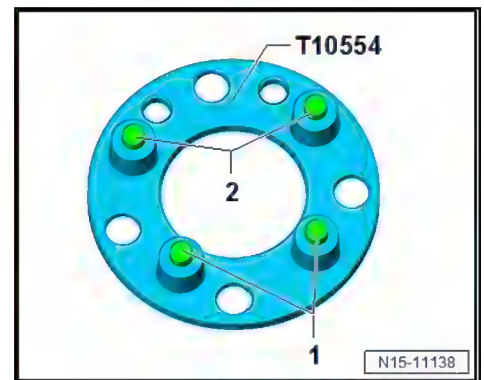


- Attach the Counterhold - Multiple Use -T10172A- and Counterhold -T10554/1- using the Knurled Bolts - T10554/2- -arrows-.

## Removing

- Place a cleaning cloth under the camshaft adjuster and the tensioning roller to catch escaping engine oil.
- The contact points for the toothed belt, as on the camshaft sprocket, crankshaft toothed belt sprockets, tensioning roller and the idler roller must be kept free of oil.
- Position the engine in the “TDC position for cylinder 1”. Refer to ➤ [T2.5 Timing, Checking](#), page 177 .
- Remove the toothed belt from the camshafts. Refer to ➤ [B2.7 Belt, Removing from Camshafts](#), page 193 .

## Installing the Counterhold -T10554-

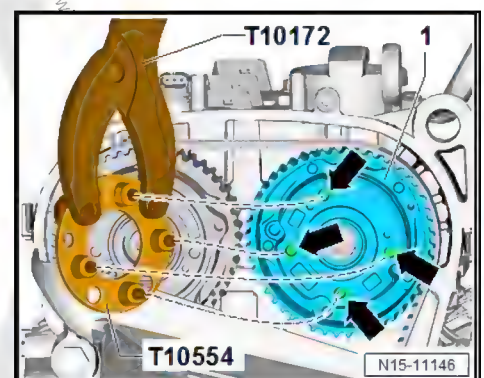


- The distance between the pins -1 and 2- from the Counterhold -T10554- varies.
- The Counterhold -T10554- can only be inserted in one position.



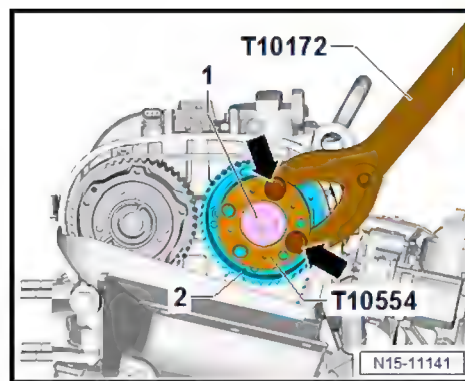
**There is a risk of damaging the camshaft if handled incorrectly.**

- **Never use the camshaft positioning tool as a counterholder.**
- Place the Counterhold -T10554- with Counterhold - Multiple Use -T10172A- flat on the camshaft adjuster -1- as shown.

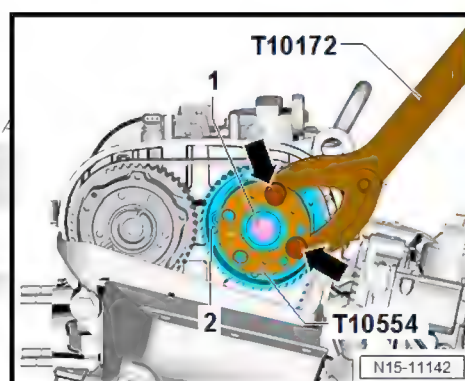


- The pins must be inserted correctly in the holes -arrows-.
- Secure the camshafts from turning using the Counterhold -T10554- and Counterhold - Multiple Use -T10172A-.
- Remove the plug -1- on the intake camshaft adjuster.





- To loosen the bolt -1- from the camshaft adjuster, install the Counterhold -T10554- with Counterhold - Kit - Multiple Use -T10172- again.



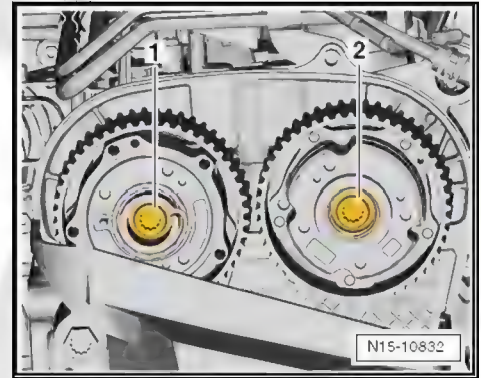
- Loosen the bolt -1- from the camshaft adjuster -2-.
- Loosen the bolt from the exhaust camshaft adjuster. Refer to [⇒ C3.4.2 amshaft Adjuster, Removing and Installing](#), page 217 .
- Remove the bolt -1- for the camshaft adjuster and then remove the camshaft adjuster -2-.

#### Installing

- The camshafts are secured in the "TDC point".
- The camshaft sprockets are positioned to each other.
- The crankshaft is at "TDC point".
- The guide sleeve from the camshaft adjuster must be placed on the camshaft before installing.
- Replace the bolts that were tightened with an additional turn.
- Replace the seal for the plug if it is damaged.
- Remove the camshaft adjuster.







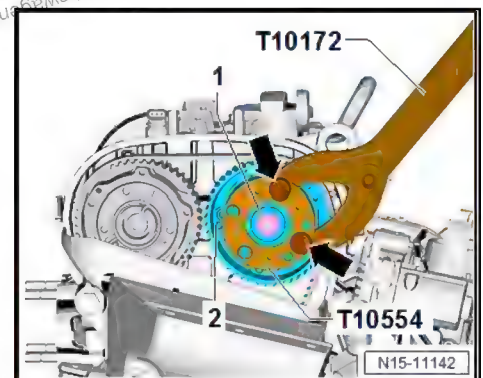
- Replace the bolts -1- and 2- for the camshaft adjuster and install them loosely.
- The camshaft sprockets must still turn on the camshafts and may not tip.



**Risk of destroying the engine by adjusting the valve timing.**

- Do not turn the crankshaft out of TDC.
- Install the toothed belt and adjust valve timing. Refer to ➤ [T2.6 Timing, Adjusting](#), page 184.

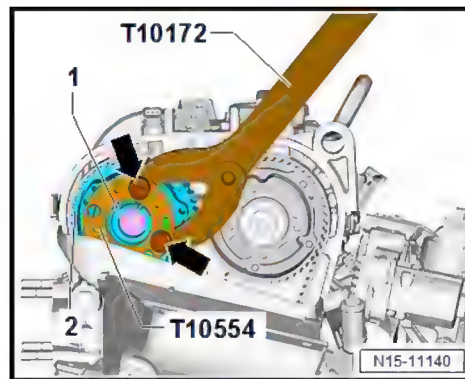
#### Pre-Tightening Procedure



- Hold the intake camshaft with the Counterhold -T10554- and Counterhold - Kit - Multiple Use - T10172- in the position.
- Tighten the bolt -1- in two steps to the pre-tightening specification.
- A second technician is needed to counterhold.

Step	Component	Tightening Specification
1	Intake camshaft adjuster bolt -1-	18 Nm
2	Intake camshaft adjuster bolt -1-	50 Nm

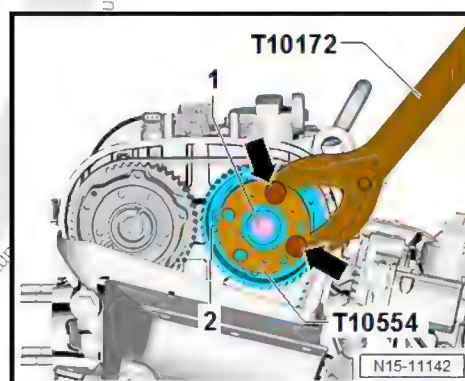
- Hold the exhaust camshaft with the Counterhold -T10554- and Counterhold - Kit - Multiple Use - T10172- in the position.



- Tighten the bolt -1- in two steps to the pre-tightening specification.

Step	Component	Tightening Specification
1	Exhaust camshaft adjuster bolt -1-	18 Nm
2	Exhaust camshaft adjuster bolt -1-	50 Nm

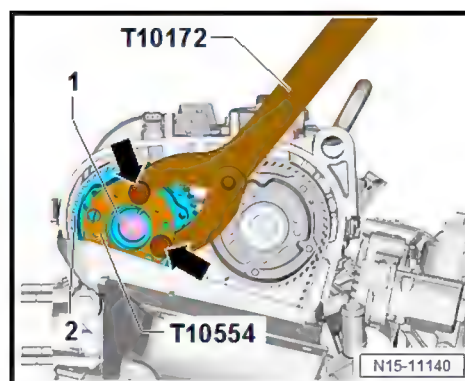
#### Final Tightening Procedure



- Tighten the bolt -1- for the camshaft adjuster to the final tightening specification.

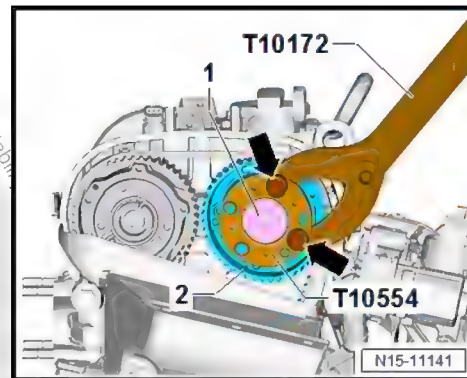
Component	Additional Turn
Intake camshaft adjuster bolt -1-	135°

- Tighten the bolt for the exhaust camshaft adjuster -1- to the final tightening specification.



Component	Additional Turn
Exhaust camshaft adjuster bolt -1-	135°

- Hold the intake camshaft with the Counterhold -T10554- and Counterhold - Kit - Multiple Use - T10172- in the position.



- Install the plug -1- and tighten to the tightening specification.

Component	Tightening Specification
Camshaft adjuster plug -1-	20 Nm

### Assembling

Assembly is performed in reverse order.

### Tightening Specifications

- ◆ Refer to ➤ [-1.2 Camshaft Housing](#)”, page 149
- ◆ Refer to ➤ [-2.1 Toothed Belt Guard](#)”, page 165
- ◆ Refer to ➤ [-2.2 Toothed Belt](#)”, page 185
- ◆ Refer to ➤ [-2.1 Charge Air System](#)”, page 345
- ◆ Refer to ➤ [-2.1 Air Filter Housing](#)”, page 368
- ◆ Refer to ➤ [Fig. ““Plug for TDC Hole in Cylinder Block - Tightening Specification””, page 167](#)

## 3.4.2 Exhaust Camshaft Adjuster, Removing and Installing

Special tools and workshop equipment required

- ◆ Electronic Torque Wrench 3-60Nm -VAS 6583-





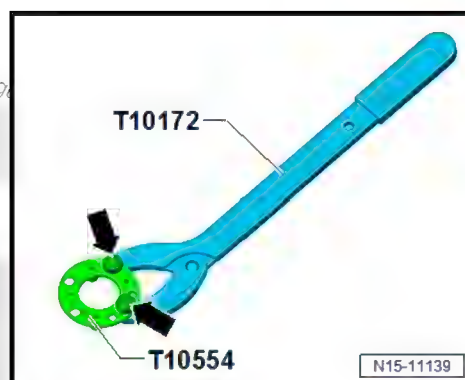
◆ Counterhold - Multiple Use -T10172A-



◆ Counterhold -T10554-



### Tool Preparation

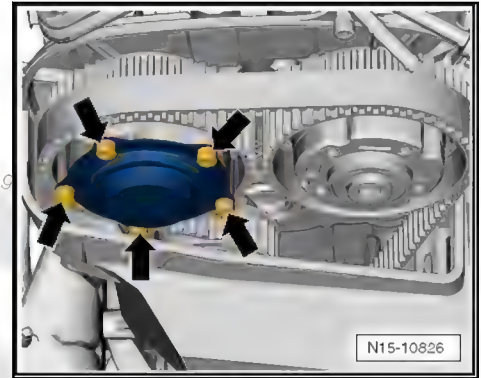


- Attach the Counterhold - Multiple Use -T10172A- and Counterhold -T10554/1- using the Knurled Bolts - T10554/2- -arrows-.

### Removing

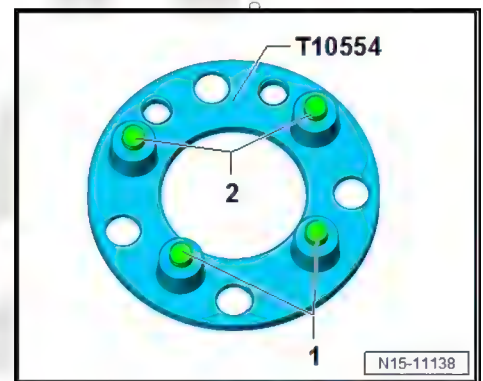
- Place a cleaning cloth under the camshaft adjuster and the tensioning roller to catch escaping engine oil.
- The contact points for the toothed belt, as on the camshaft sprocket, crankshaft toothed belt sprockets, tensioning roller and the idler roller must be kept free of oil.
- Remove the toothed belt from the camshafts. Refer to [B2.7 elt, Removing from Camshafts](#), page 193 .
- Remove the bolts -arrows- and then remove the cover from the exhaust camshaft adjuster.





- To reach the following bolts, the camshaft must be turned further.
- Remove the cover from the camshaft adjuster for the exhaust camshaft.

#### Installing the Counterhold -T10554-

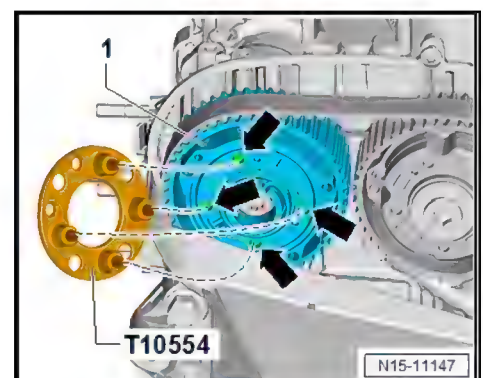


- The distance between the pins -1 and 2- from the Counterhold -T10554- varies.
- The Counterhold -T10554- can only be inserted in one position.

#### ! NOTICE

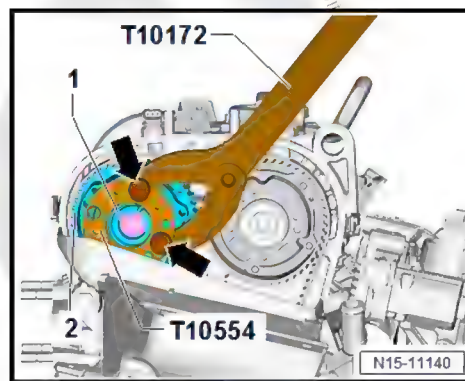
There is a risk of damaging the camshaft if handled incorrectly.

- Never use the camshaft positioning tool as a counterholder.
- Guide the Counterhold - T10554- between the camshaft adjuster and the engine support.





- Turn the Counterhold -T10554- so that the Counterhold -T10554- can be inserted in the holes -arrows- as shown.
- Place the Counterhold -T10554- flat on the camshaft adjuster -1-.
- Loosen the bolt -1- one turn. Secure the exhaust camshaft adjuster from turning using the Counterhold -T10554- and Counterhold - Multiple Use -T10172A-.

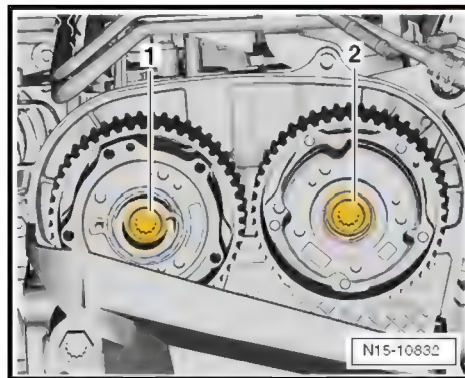


- Loosen the bolt from the intake camshaft adjuster. Refer to [⇒ C3.4.1 amshaft Adjuster, Removing and Installing](#), page 211 .
- Remove the exhaust camshaft adjuster.

### Installing

Install in the reverse order of removal while noting the following:

- The camshafts are secured in the "TDC point".
- The camshaft sprockets are positioned to each other.
- The crankshaft is at "TDC point".
- The guide sleeve from the camshaft adjuster must be placed on the camshaft before installing.
- Replace the bolts that were tightened with an additional turn.
- Replace the seal for the plug if it is damaged.
- Remove the camshaft adjuster.
- Replace the bolts -1 and 2- for the camshaft adjuster and install them loosely.

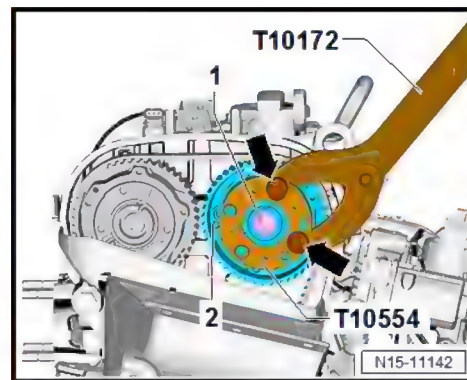


- The camshaft sprockets must still turn on the camshafts and may not tip.

**NOTICE**

Risk of destroying the engine by adjusting the valve timing.

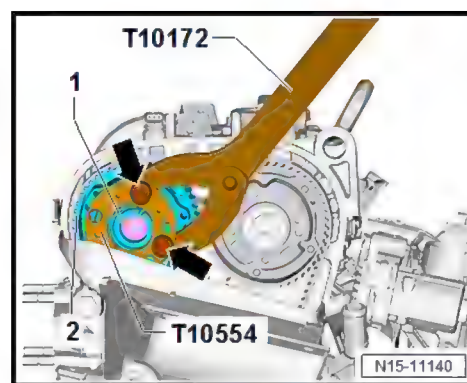
- Do not turn the crankshaft out of TDC.
- Install the toothed belt and adjust valve timing. Refer to ➤ [T2.6 Timing, Adjusting", page 184](#).

**Pre-Tightening Procedure**

- Hold the intake camshaft with the Counterhold -T10554- and Counterhold - Kit - Multiple Use - T10172- in the position.
- Tighten the bolt -1- in two steps to the pre-tightening specification.
- A second technician is needed to counterhold.

Step	Component	Tightening Specification
1	Intake camshaft adjuster bolt -1-	18 Nm
2	Intake camshaft adjuster bolt -1-	50 Nm

- Hold the exhaust camshaft with the Counterhold -T10554- and Counterhold - Kit - Multiple Use - T10172- in the position.

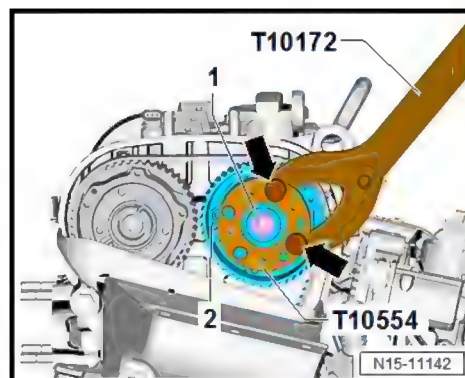


- Tighten the bolt -1- in two steps to the pre-tightening specification.

Step	Component	Tightening Specification
1	Exhaust camshaft adjuster bolt -1-	18 Nm
2	Exhaust camshaft adjuster bolt -1-	50 Nm



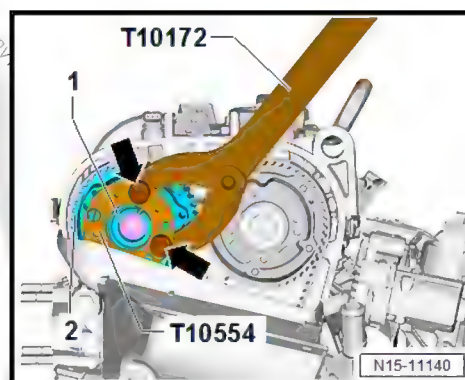
## Final Tightening Procedure



- Tighten the bolt -1- for the camshaft adjuster to the final tightening specification.

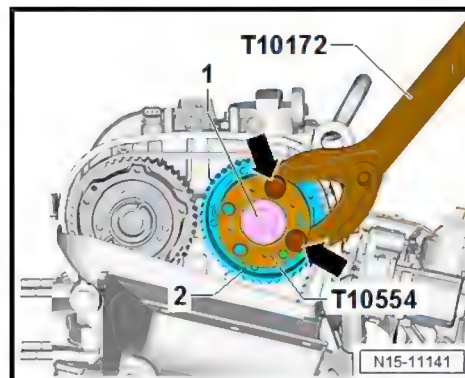
Component	Additional Turn
Intake camshaft adjuster bolt -1-	135°

- Tighten the bolt for the exhaust camshaft adjuster -1- to the final tightening specification.



Component	Additional Turn
Exhaust camshaft adjuster bolt -1-	135°

- Hold the intake camshaft with the Counterhold -T10554- and Counterhold - Kit - Multiple Use - T10172- in the position.



- Install the plug -1- and tighten to the tightening specification.

Component	Tightening Specification
Plug -1-	20 Nm



## Assembling

Install in the reverse order of removal while noting the following:



### Note

*Remove the camshaft positioning tool and the bolt for the crankshaft before turning the engine.*

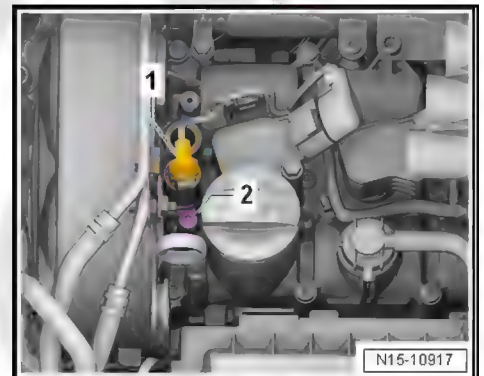
## Tightening Specifications

- ◆ Refer to ➔ [-2.1 Toothed Belt Guard", page 165](#)
- ◆ Refer to ➔ [-2.2 Toothed Belt", page 165](#)
- ◆ Refer to ➔ [-1.2 Camshaft Housing", page 149](#)
- ◆ Refer to ➔ [-2.1 Assembly Mounts", page 71](#)
- ◆ Refer to ➔ [-2.1 Charge Air System", page 345](#)
- ◆ Refer to ➔ [-2.1 Air Filter Housing", page 368](#)
- ◆ Refer to ➔ [Fig. "Plug for TDC Hole in Cylinder Block - Tightening Specification", page 167](#)

## 3.5 Camshaft Adjustment Valve 1 -N205-, Removing and Installing

### Removing

- Disconnect the connector -1-.



- Remove the bolt -2- and the Camshaft Adjustment Valve 1 -N205-.

### Installing

Install in the reverse order of removal while noting the following:

- Replace the seal.

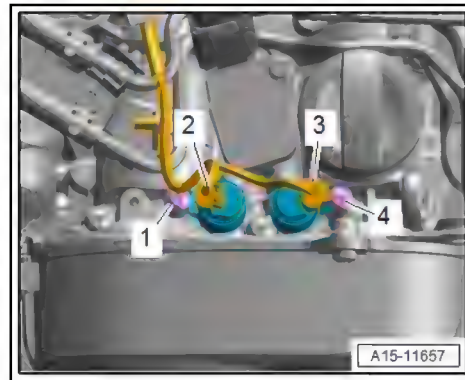
## Tightening Specifications

- ◆ Refer to ➔ [-1.2 Camshaft Housing", page 149](#)

## 3.6 Exhaust Camshaft Adjustment Valve 1 -N318-, Removing and Installing

### Removing

- Disconnect the connector -2-.



- Remove the bolt -1- and remove the Exhaust Camshaft Adjustment Valve 1 -N318-.

#### Installing

Install in the reverse order of removal while noting the following:

- Replace the seal.

#### Tightening Specifications

- ◆ Refer to ➔ [-1.2 Camshaft Housing-, page 149](#)

### 3.7 Valve Stem Seals, Removing and Installing

➔ [S3.7.1 tem Seals, Removing and Installing, Cylinder Head Installed-, page 224](#)

➔ [S3.7.2 tem Seals, Removing and Installing, Cylinder Head Removed-, page 228](#)

#### 3.7.1 Valve Stem Seals, Removing and Installing, Cylinder Head Installed

Special tools and workshop equipment required

- ◆ Spark Plug Removal Tool -3122 B-





◆ Seal Installer - Valve Stem -3365-

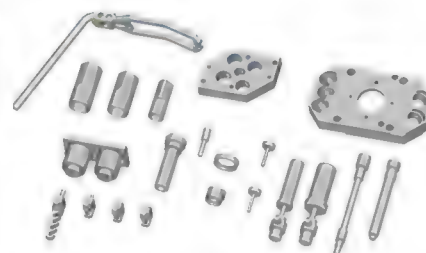
**3365**



W00-11141

◆ Valve Keeper Tool Kit -VAS 5161 A- with Valve Keeper Tool Kit - Guide Plate 32 -VAS 5161 A/32-.

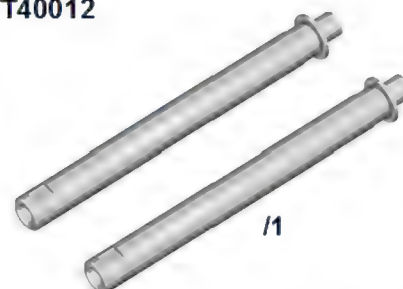
**VAS 5161 A**



W00-11584

◆ Valve Cotter Tool Kit - Adapter -T40012-

**T40012**



W00-11270

◆ Pliers - Valve Seal -VAS 6770-

**VAS 6770**



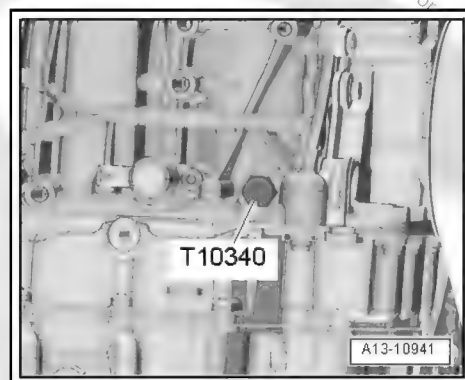
W00-11550

**Procedure**

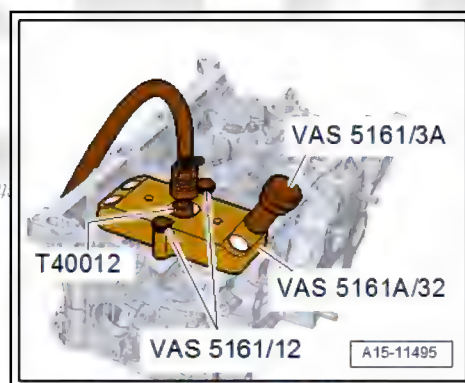
- Remove the camshaft housing. Refer to ➔ [H1.4 ousing, Removing and Installing”, page 157](#) .
- Remove the spark plugs with the Spark Plug Removal Tool -3122 B-.



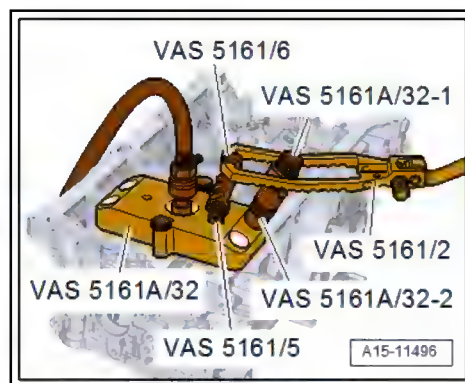
- Remove the Crankshaft Locking Pin -T10340-.



- Set the piston for the respective cylinder to "bottom dead center (BDC)".
- Position the Valve Keeper Tool Kit - Guide Plate 32 -VAS 5161/32-1- on the cylinder head and tighten using the Knurled Thumb Screws M6 -VAS 5161/12-.



- Install the Valve Cotter Tool Kit - Adapter -T40012- with seal in the spark plug thread and tighten by hand.
- Connect the adapter to the compressed air using a commercially available intermediate piece and give steady pressure.
- Minimum pressure: 6 bar (87.02 psi)
- Insert the Punch -VAS 5161/3A- into the guide plate and loosen the stuck valve keepers with a plastic mallet.
- Install the Valve Cotter Tool Kit - Retainer -VAS 5161/6- with the Guide Forks M6/M8 with Valve Cotter Tool Kit - Threaded Studs -VAS 5161/5- in the guide plate.



- Insert the Installation Cartridge -VAS 5161/32-2- with the Sleeve -VAS 5161 A/32-3- installed into the guide plate.



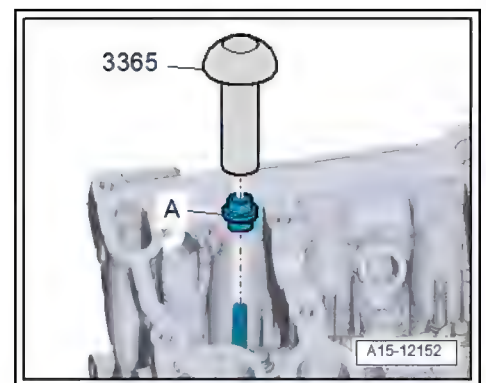
- Engage the Valve Keeper Tool Kit - Pressure Fork -VAS 5161/2- at the engaging device and press the installation cartridge downward.
- At the same time, turn the installation cartridge knurled bolt right until points engage in the valve keepers.
- Move the knurled bolt left and right slightly. This presses the valve keepers apart and captures them in the assembly cartridge.
- Release the pressure fork.
- Remove the assembly cartridge.
- Remove the guide plate and turn it aside.
- The pressurized air hose remains connected.
- Remove the valve spring and the valve spring retainer.
- Remove the valve stem seal using the Pliers - Valve Seal -VAS 6770-.



#### Note

*There is a risk of damage when installing valve stem seals.*

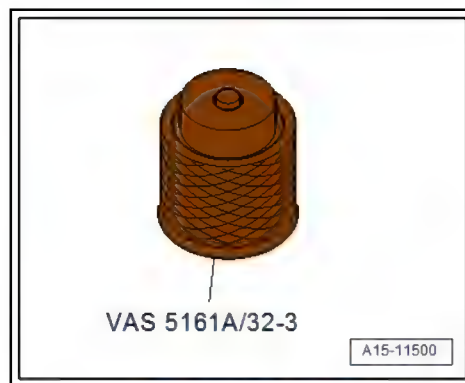
- Lightly lubricate the valve stem seal sealing lip -A-.



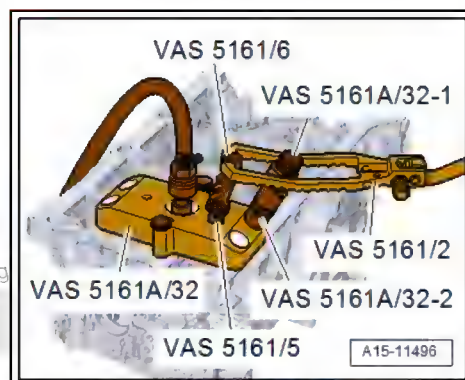
- Carefully press the valve stem seal -A- onto the valve guide with the Seal Installer - Valve Stem -3365-.



If the valve retainers were removed from the installation cartridge, they must be inserted in the valve insertion device next.



- The large diameter of the valve keepers point upward.
- Press the cartridge from above onto the insertion device and valve keepers.
- Install the valve spring and valve spring retainer, valve spring installed position. Refer to ➤ [Fig. "Installation Position of Valve Spring", page 200](#).
- Fasten the Guide Plate -VAS 5161/32-1- to the cylinder head again.



- Insert the Installation Cartridge -VAS 5161/32-2- with the Sleeve -VAS 5161 A/32-3- into the guide plate.
- Press the pressure fork down and pull the knurled bolt up while turning left and right. This inserts the valve keepers.
- Release the pressure fork with the knurled bolt still raised.
- Repeat the procedure on each valve.

#### Assembling

Assemble in the reverse order of removal. Note the following:

- Install the spark plugs. Refer to ➤ Maintenance; Booklet.
- Install the camshaft housing. Refer to ➤ [H1.4 ousing, Removing and Installing", page 157](#).

### 3.7.2 Valve Stem Seals, Removing and Installing, Cylinder Head Removed

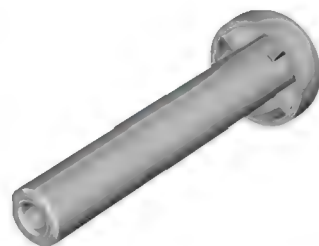
Special tools and workshop equipment required





◆ Seal Installer - Valve Stem -3365-

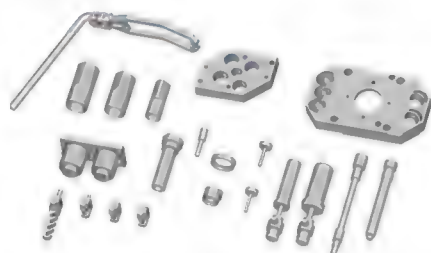
**3365**



W00-11141

◆ Valve Keeper Tool Kit -VAS 5161 A- with Valve Keeper Tool Kit - Guide Plate 32 -VAS 5161 A/32-

**VAS 5161 A**



W00-11584

◆ Engine and Transmission Holder -VAS 6095A-

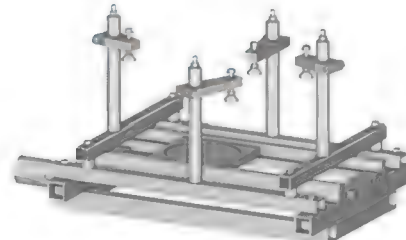
**VAS 6095**



W00-11310

◆ Cylinder Head Tensioning Device -VAS 6419-

**VAS 6419**



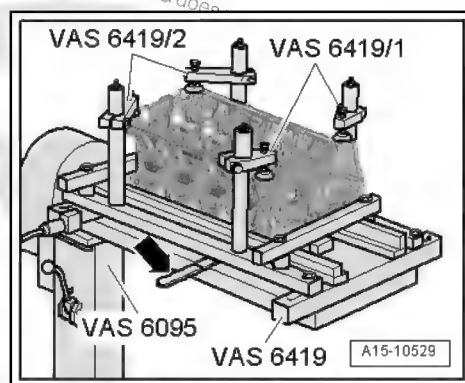
W00-11254



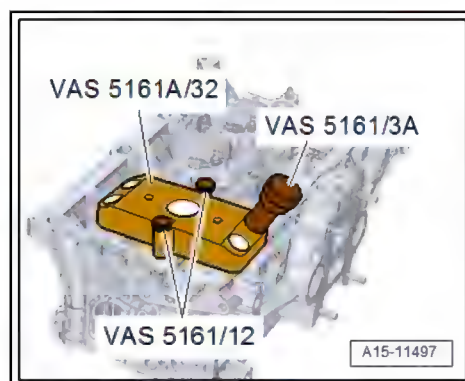
◆ Pliers - Valve Seal -VAS 6770-



Procedure

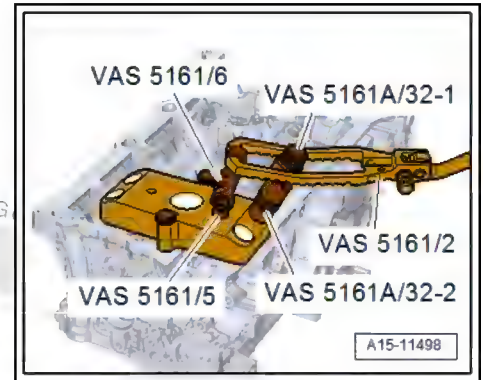


- Remove the cylinder head. Refer to [⇒ H1.3 ead, Removing and Installing](#), page 152 .
- Insert the Cylinder Head Tensioning Device -VAS 6419- in the Engine and Gearbox Bracket -VAS 6095A-.
- Tension the cylinder head on the cylinder head tensioning device, as shown.
- Connect the cylinder head tensioning device to compressed air.
- Slide the air cushion with the lever -arrow- under the combustion chamber onto the valve stem seals that will be removed.
- Let enough compressed air flow into the air cushion until it contacts the valve plate.
- Position the Valve Keeper Tool Kit - Guide Plate 32 -VAS 5161/32-1- on the cylinder head and tighten using the Knurled Thumb Screws M6 -VAS 5161/12-.

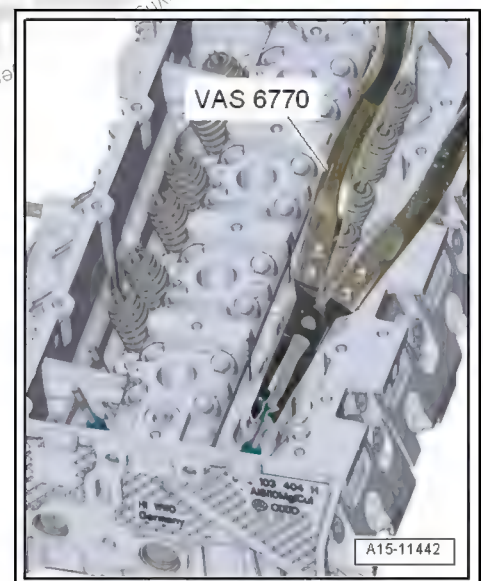




- Insert the Punch -VAS 5161/3A- into the guide plate and loosen the stuck valve keepers with a plastic mallet.
- Install the Valve Cotter Tool Kit - Retainer -VAS 5161/6- with the Guide Forks M6/M8 with Valve Cotter Tool Kit - Threaded Studs -VAS 5161/5- in the guide plate.



- Insert the Installation Cartridge -VAS 5161/32-2- with the Sleeve -VAS 5161 A/32-3- installed into the guide plate.
- Engage the Valve Keeper Tool Kit - Pressure Fork -VAS 5161/2- at the engaging device and press the installation cartridge downward.
- At the same time, turn the installation cartridge knurled bolt right until points engage in the valve keepers.
- Move the knurled bolt left and right slightly. This presses the valve keepers apart and captures them in the assembly cartridge.
- Release the pressure fork.
- Remove the assembly cartridge.
- Remove the guide plate and turn it aside.
- Remove the valve spring and the valve spring retainer.
- Remove the valve stem seal using the Pliers - Valve Seal -VAS 6770-.

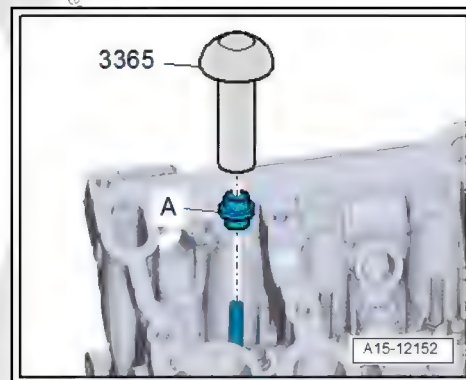




#### Note

*There is a risk of damage when installing valve stem seals.*

- Lightly lubricate the valve stem seal sealing lip -A-.

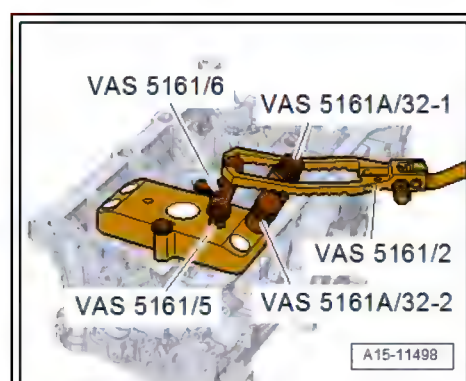


- Carefully press the valve stem seal -A- onto the valve guide with the Seal Installer - Valve Stem -3365-.

If the valve retainers were removed from the installation cartridge, they must be inserted in the valve insertion device next.



- The large diameter of the valve keepers point upward.
- Press the cartridge from above onto the insertion device and valve keepers.
- Install the valve spring and valve spring retainer, valve spring installed position. Refer to [Fig. "Installation Position of Valve Spring", page 200](#).
- Fasten the Guide Plate -VAS 5161/32-1- to the cylinder head again.





- Insert the Installation Cartridge -VAS 5161/32-2- with the Sleeve -VAS 5161 A/32-3- into the guide plate.
- Press the pressure fork down and pull the knurled bolt up while turning left and right. This inserts the valve keepers.
- Release the pressure fork with the knurled bolt still raised.
- Repeat the procedure on each valve.
- Install the cylinder head. Refer to [⇒ H1.3 ead, Removing and Installing”, page 152](#) .





## 4 Intake and Exhaust Valves

⇒ [G4.1 uides, Checking", page 234](#)

⇒ [C4.2 hecking", page 235](#)

⇒ [D4.3 imensions", page 235](#)

### 4.1 Valve Guides, Checking

Special tools and workshop equipment required

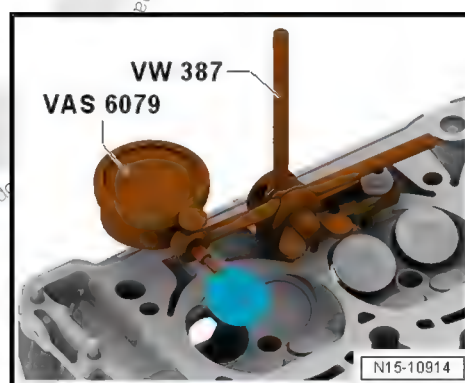
◆ Dial Gauge Holder -VW 387-



◆ Dial Gauge -0-10mm -VAS 6079-



#### Test Sequence



- Insert the valve into guide. The valve stem end must be flush with the guide. Due to differences in valve stem diameter, only use intake valves in intake valve guides, and exhaust valves in exhaust valve guides.
- Determine the tilting clearance.
  - Wear limit: 0.5 mm.
- If the wear limit is exceeded, measure using new valves.





- Replace the cylinder head if the wear limit is still exceeded.



Note

*The valve guides cannot be replaced.*

## 4.2 Valves, Checking

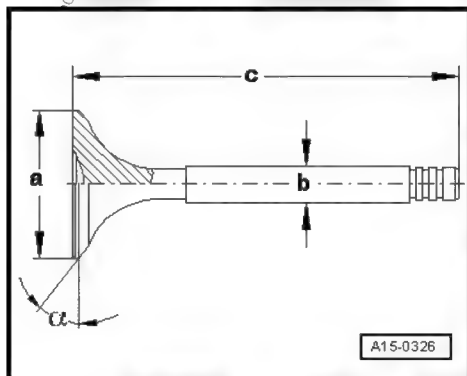
- Check the valves at stem and seat surface for wear grooves.
- If there are clear wear grooves, replace the valve.

## 4.3 Valve Dimensions



Note

*Intake and exhaust valves must not be reworked. Only grinding is permitted.*



Dimension		Intake Valve	Exhaust Valve
Diameter	mm	28.5	25.0
a			
Diameter	mm	4.973	4.963
b			
c	mm	110.25	110.09
α	°	45	30





## 17 – Lubrication

### 1 Oil Pan/Oil Pump

⇒ [1.1 Oil Pan/Oil Pump", page 236](#)

⇒ [O1.2 il", page 240](#)

⇒ [P1.3 an Lower Section, Removing and Installing", page 240](#)

⇒ [P1.4 an Upper Section, Removing and Installing", page 245](#)

⇒ [P1.5 ump, Removing and Installing", page 253](#)

⇒ [O1.6 il Level Thermal SensorG266, Removing and Installing", page 254](#)

#### 1.1 Overview - Oil Pan/Oil Pump



##### Note

- ◆ *If large quantities of metal shavings or abraded material are detected during an engine repair, it may mean the crankshaft or connecting rod bearings are damaged. To prevent damage, perform the following steps after completing the repair: carefully clean the oil channels and replace the oil spray jets, the oil cooler and the oil filter.*
- ◆ *Oil spray jet and pressure relief valve. Refer to ⇒ [Fig. ""Oil Spray Jet and Pressure Relief Valve""](#), page 141.*



**1 - Nut**

- ☐ 9 Nm

**2 - Oil Level Thermal Sensor -G266-**

- ☐ Removing and Installing. Refer to [⇒ O1.6 Oil Level Thermal Sensor G266, Removing and Installing](#), page 254.

**3 - Seal**

- ☐ Replace after removing

**4 - Oil Drain Plug**

- ☐ 30 Nm
- ☐ Replace after removing

**5 - Seal**

- ☐ Replace after removing

**6 - Oil Pan Lower Section**

- ☐ Removing and Installing. Refer to [⇒ P1.3 Oil Pan Lower Section, Removing and Installing](#), page 240.

**7 - Bolt**

- ☐ 5 Nm +90°
- ☐ Replace after removing

**8 - Alignment Sleeve**

- ☐ Quantity: 2

**9 - Cover**

- ☐ For the oil pump drive chain sprocket

**10 - Drive Chain**

- ☐ For the oil pump
- ☐ Before removing, mark the running direction with paint

**11 - Bolt**

- ☐ Replace after removing
- ☐ Tightening specification and sequence. Refer to [⇒ Fig. "Oil Pan Upper Section - Tightening Specifications and Sequence"](#), page 239.

**12 - Oil Pan Upper Section**

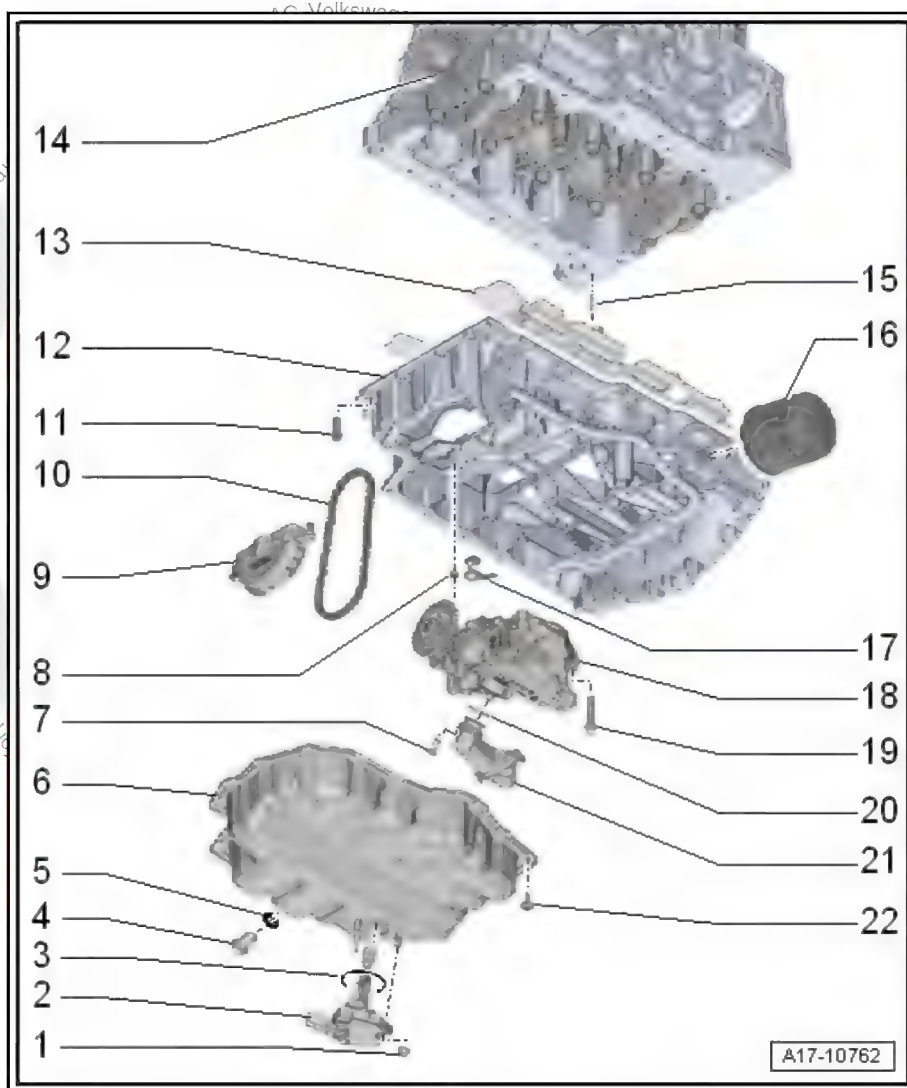
- ☐ Removing and Installing. Refer to [⇒ P1.4 Oil Pan Upper Section, Removing and Installing](#), page 245.

**13 - Oil Baffle****14 - Chain Sprocket**

- ☐ For oil pump drive

**15 - Alignment Pin****16 - Oil Filter**

- ☐ 20 Nm
- ☐ See note. Refer to [⇒ page 236](#).
- ☐ Coat the seal with clean engine oil before installing
- ☐ Removing and Installing. Refer to [⇒ Maintenance; Booklet 821](#).





- ❑ If the threaded connections for the oil filter are loosened in the oil pan, refer to ⇒ [Fig. ““Retainer Threaded Connection for the Oil Filter””, page 238](#) .

#### 17 - Seal

- ❑ With oil strainer

#### 18 - Oil Pump

- ❑ Removing and Installing. Refer to ⇒ [P1.5 ump, Removing and Installing”, page 253](#) .

#### 19 - Bolt

- ❑ 10 Nm

#### 20 - Seal

- ❑ Replace after removing

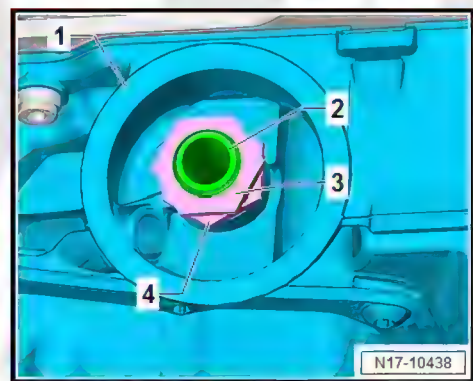
#### 21 - Oil Intake Pipe

- ❑ Clean the screen if there are debris

#### 22 - Bolt

- ❑ Replace after removing
- ❑ Tightening sequence. Refer to ⇒ [Fig. “Oil Pan Lower Section - Tightening Specification and Sequence””, page 238](#) .

#### Retainer Threaded Connection for the Oil Filter



- If the threaded connections -2- from the oil pan -1- are loosened, secure them again as described as follows.

#### Perform the Procedure Exclusively Using the Nuts -3 and 4-

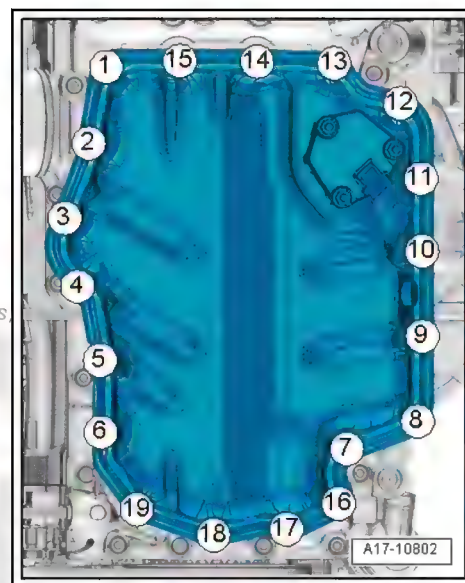
- Hex Nuts (quantity: 2). Refer to the ⇒ Electronic Parts Catalog (ETKA).
- Unscrew the nuts -3 and 4- from the threaded connection -2- and then tighten against each other (secure).
- Tighten the threaded connection -2- via the nut -3-.
- Loosen both nuts and screw down, at the same time pay attention that the threaded connection is not loosened.

#### Tightening Specifications

Component	Tightening Specification
Threaded connection -2-	50 Nm

#### Oil Pan Lower Section - Tightening Specification and Sequence

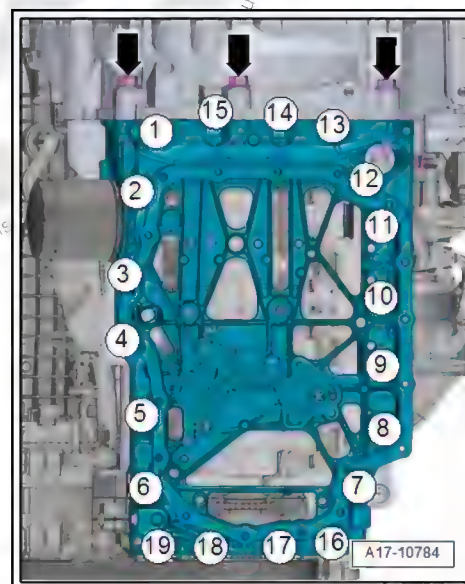




- Tighten the bolts in steps in the sequence -1 to 19-:

Step	Component	Tightening Specification
1	Bolts -1 through 19-	Install all the way by hand
2	Bolts -1 through 19-	12 Nm

#### Oil Pan Upper Section - Tightening Specifications and Sequence



#### Note

*Replace bolts that were tightened with an additional turn after removing them.*

- Tighten the bolts in the steps in the sequence shown:

Step	Component	Tightening Specification/Additional Turn
1	Bolts -1 to 19-	Install all the way by hand



Step	Component	Tightening Specification/Additional Turn
2	Bolts -arrows-	Install all the way by hand
3	Bolts -1 to 19-	8 Nm
4	Bolts -1 to 19-	90° additional turn
5	Bolts -arrows-	Tightening specification. Refer to ⇒ Rep. Gr. 34; Transmission, Re- moving and Installing; Transmission Tightening Specifications.

## 1.2 Engine Oil

### Engine Oil Capacity

With oil filter 4.0 liters

Oil quantities, oil specifications and viscosity classes. Refer to the ⇒ Maintenance Tables.

## 1.3 Oil Pan Lower Section, Removing and Installing

### Special tools and workshop equipment required

- ♦ Wedge Set - Wedge 2 -T10383/2-

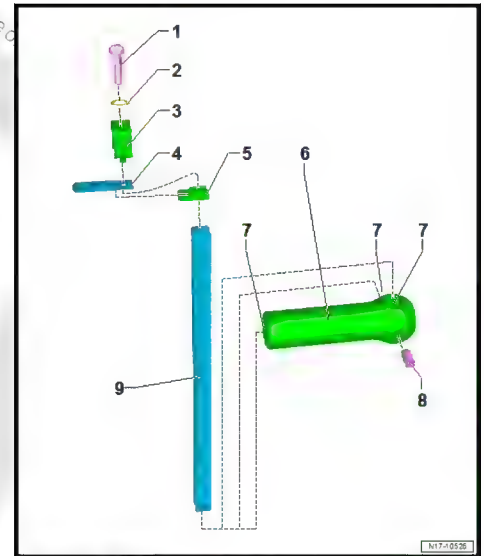


- ♦ Applicator Gun -VAS 6966-



- ♦ Flat-Blade Scraper
- ♦ Commercially Available Scraper
- ♦ Sealant Remover
- ♦ Hand Drill with Plastic Brush Attachment
- ♦ Protective Eyewear
- ♦ Refer to the ⇒ Electronic Parts Catalog (ETKA) for the correct sealant.

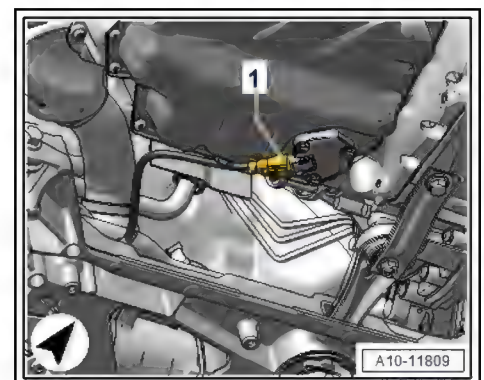
Cutting Tool -T10561-



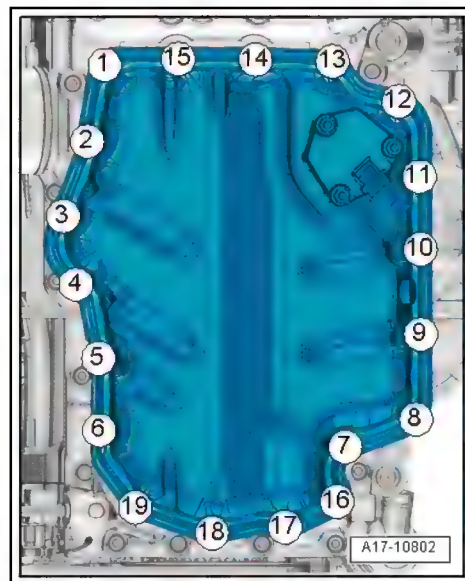
- 1 - Bolt
- 2 - Washer
- 3 - Bracket
- 4 - Knife
- 5 - Guide
- 6 - Handle
- 7 - Insert for the mount to move the handle
- 8 - Bolt
- 9 - Mount

#### Removing

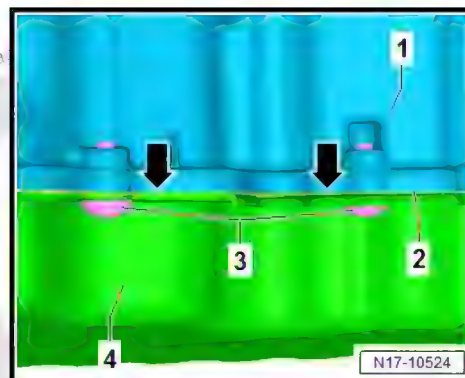
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation.
- Drain the engine oil. Refer to ⇒ Maintenance; Booklet 821.
- Disconnect the connector -1- on the Oil Level Thermal Sensor -G266-.



- Remove the Oil Level Thermal Sensor -G266-. Refer to ⇒ [Oil Level Thermal Sensor G266, Removing and Installing", page 254](#).
- Loosen and remove the bolts in a -19 through 1- sequence.



- Disconnect the bonding between the oil pan lower section -4- and the oil pan upper section -1-.



- To do so use the Cutting Tool -T10561-.

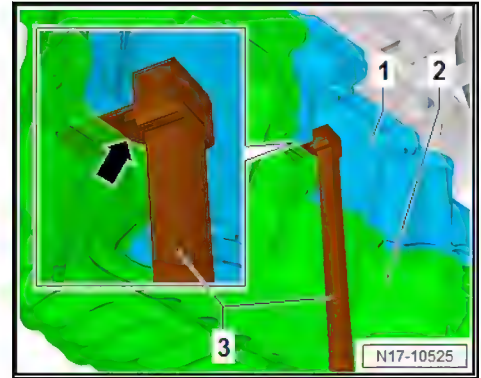


#### Note

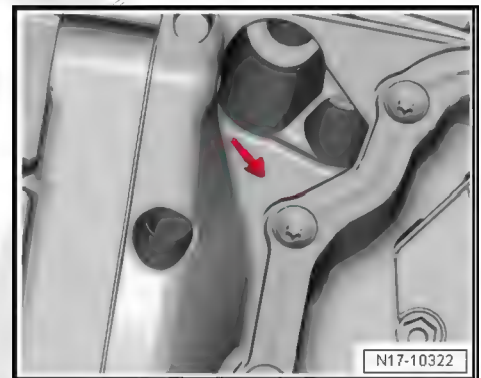
- ◆ The oil pan is sealed using a liquid sealant -2-. Refer to the ⇒ *Electronic Parts Catalog (ETKA)*.
- ◆ The sealant has a high adhesion strength in the hardened state.
- Place the Cutting Tool -T10561- without tilting on the bonding -arrows-.
- Drive in the Cutting Tool -T10561- -3- using a rubber hammer until it stops -arrow-.







- At the same time do not tilt the Cutting Tool -T10561-.
- Do not perform any sideways movement using the Cutting Tool -T10561-.
- Do not lift using the Cutting Tool -T10561-.
- Perform the procedure on the other locations as described until the oil pan is loosened.
- For additional loosening use the Wedge Set - Wedge 2 -T10383/2-.
- Then insert the Wedge Set - Wedge 2 -T10383/2- on the loosened positions where possible.
- Carefully drive in the wedge with a plastic mallet.
- Carefully loosen the oil pan lower section from the bond.
- Move the Wedge Set - Wedge 2 -T10383/2- and loosen the bonding on the other positions.
- Using a screwdriver, carefully pry out the oil pan lower section at the location marked with an -arrow-.



- Carefully loosen the oil pan lower section from the bonding using a commercially available scraper.

#### Installing

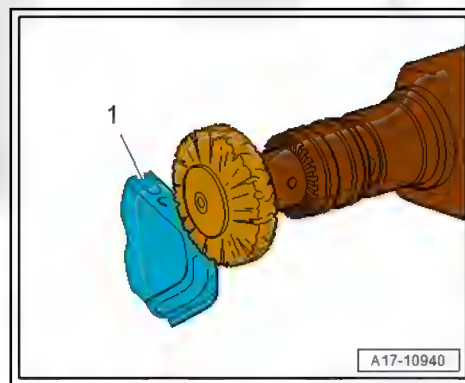
- Cover open engine components.
- Spray the sealing surface with sealant remover and allow it to work.
- Remove any sealant residue on the oil pan upper section using a flat-blade scraper.



**⚠ CAUTION**

**Risk of injuring the eyes from sealant residue.**

- Wear protective eyewear.
- Remove any remaining sealant from the oil pan lower section using, for example, a rotating plastic brush.

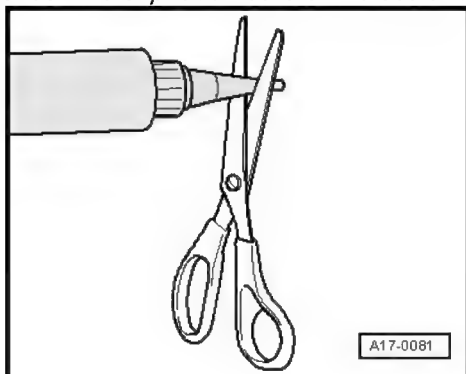


- Clean any oil or grease off the sealing surfaces.

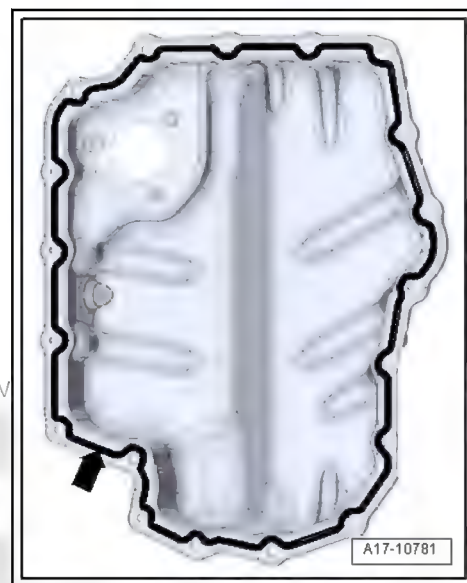


**Note**

*Be sure to check the expiration date of the sealant.*



- Cut the tube nozzle at the front marking (nozzle diameter: about 2 mm).



- Apply a sealant bead -arrow- to the clean sealing surface on the lower section of the oil pan as shown.
- Do not apply sealant bead thicker than indicated.
- Sealant bead thickness: 2 to 3 mm.
- Apply the sealant bead very carefully near the sealing flange.
- The oil pan lower section must be installed within five minutes of applying the sealant.
- Position the oil pan lower section and tighten the bolts. Refer to ➤ [Fig. "Oil Pan Lower Section - Tightening Specification and Sequence", page 238](#).
- Install the Oil Level Thermal Sensor -G266-. Refer to ➤ [O1.6 Oil Level Thermal Sensor G266 Removing and Installing", page 254](#).
- After installing the oil pan lower section, let the sealant harden for about 30 minutes. Only afterward may the engine oil be replenished.
- Fill the engine oil and check the oil level. Refer to ➤ [Maintenance; Booklet 821](#).

#### Tightening Specifications

- ◆ Refer to ➤ [Fig. "Oil Pan Lower Section - Tightening Specification and Sequence", page 238](#)

## 1.4 Oil Pan Upper Section, Removing and Installing

Special tools and workshop equipment required



Jetta 2011 ➤, Jetta 2015 ➤

4-Cylinder Direct Injection (1.4L Engine 4V, EA 211, Turbocharger, Hybrid) - Edition 10.2022

◆ Hex Ball Socket -T10058-



◆ Wedge Set - Wedge 2 -T10383/2-



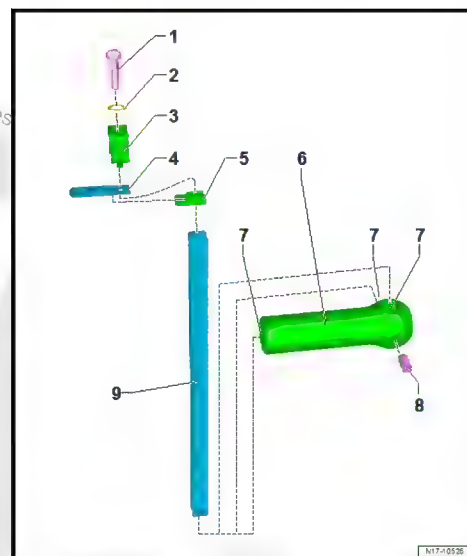
◆ Applicator Gun -VAS 6966-



- ◆ Flat-Blade Scraper
- ◆ Commercially Available Scraper
- ◆ Sealant Remover
- ◆ Hand Drill with Plastic Brush Attachment
- ◆ Protective Eyewear
- ◆ Refer to the ⇒ Electronic Parts Catalog (ETKA) for the correct sealant.

Cutting Tool -T10561-





- 1 - Bolt
- 2 - Washer
- 3 - Bracket
- 4 - Knife
- 5 - Guide
- 6 - Handle
- 7 - Insert for the mount to move the handle
- 8 - Bolt
- 9 - Mount

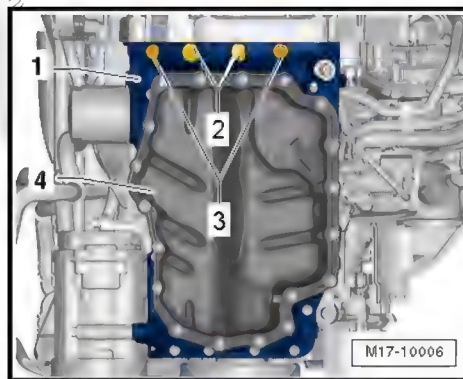
#### Removing

#### **⚠ DANGER**

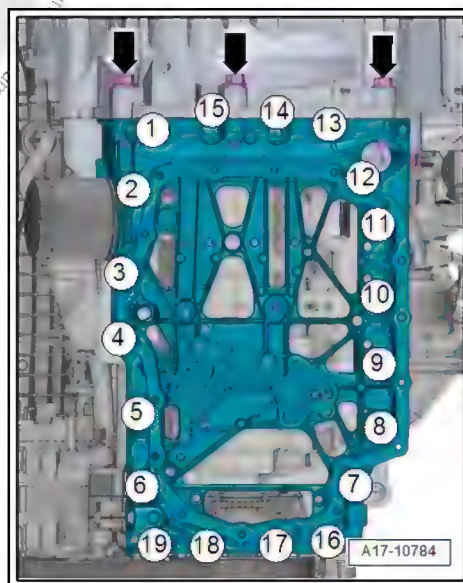
**Extremely dangerous due to high-voltage.**  
**Electrocution can cause death or very serious personal injury.**

- Have the high-voltage system de-energized by a qualified person.

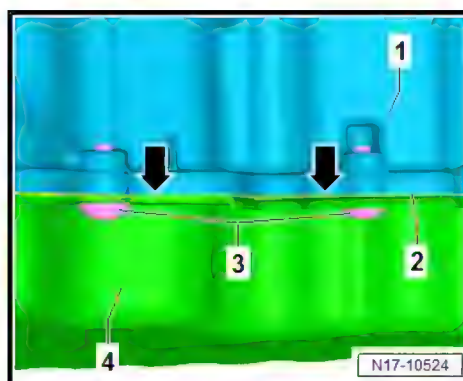
- Disable the high-voltage system. Refer to ⇒ Electrical Equipment; Rep. Gr. 93; High-Voltage System, Disabling.
- Remove the engine. Refer to ⇒ [R1.1 removing", page 8](#) .
- Electric Drive Motor -V141-, separating from engine. Refer to ⇒ [D1.3 rive MotorV141, Separating from Engine", page 29](#) .
- Remove the oil pump. Refer to ⇒ [P1.5 ump, Removing and Installing", page 253](#) .
- Push the plugs -2 and 3- through to access the bolts.



- Remove the bolts -arrows- that connect the transmission to the oil pan upper section.



- Loosen and remove the bolts in the sequence -19 to 1-.
- Disconnect the bonding between the oil pan upper section -4- and the engine -1-.



- To do so use the Cutting Tool -T10561-.

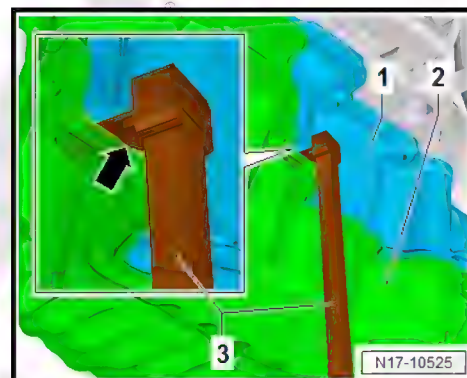


## Note

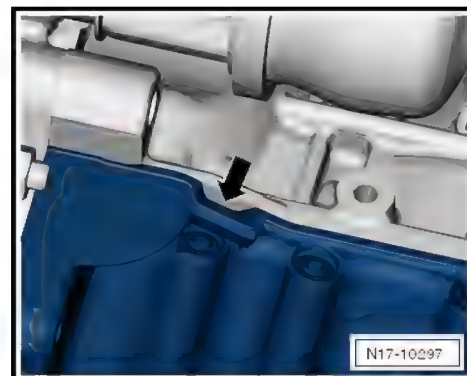
◆ The oil pan is sealed using a liquid sealant -2-. Refer to the  
⇒ Electronic Parts Catalog (ETKA).

◆ The sealant has a high adhesion strength in the hardened state.

- The separation takes place between the bolts -3-.
- Place the Cutting Tool -T10561- without tilting on the bonding -arrows-.
- Drive in the Cutting Tool -T10561- -3- using a rubber hammer until it stops -arrow-.



- At the same time do not tilt the Cutting Tool -T10561-.
- Do not perform any sideways movement using the Cutting Tool -T10561-.
- Do not lift using the Cutting Tool -T10561-.
- Perform the procedure on the other locations as described until the oil pan is loosened.
- For additional loosening use the Wedge Set - Wedge 2 -T10383/2-.
- Then insert the Wedge Set - Wedge 2 -T10383/2- on the loosened positions where possible.
- Carefully drive in the wedge with a plastic mallet.
- Carefully loosen the oil pan lower section from the bond.
- Move the Wedge Set - Wedge 2 -T10383/2- and loosen the bonding on the other positions.
- Carefully lift the oil pan from the cylinder block at the cut-out -arrow- using an extractor lever.





- Loosen the oil pan upper section from the adhesive.
- Remove the oil baffle.
- Remove the plugs from the oil pan intermediate chamber.

#### Installing

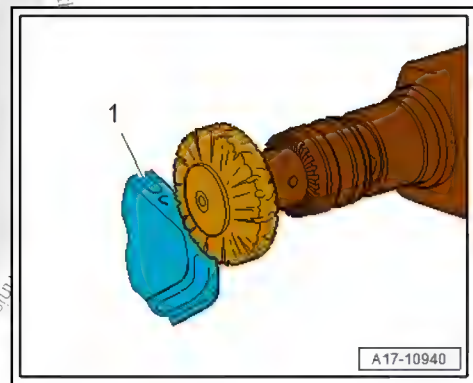
- Replace the bolts that were tightened with an additional turn.
- Replace the gaskets, seals and self-locking nuts.
- Cover open engine components.
- Remove any sealant residue on the cylinder block using a flat blade scraper.

#### ⚠ CAUTION

Risk of injuring the eyes from sealant residue.

- Wear protective eyewear.

Remove any sealant still on the oil pan upper section. Use a rotating plastic brush.

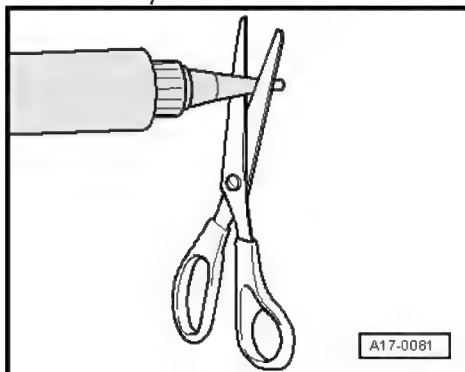


- Check for dirt in the oil channels in the oil pan upper section and in the cylinder block.
- Clean any oil or grease off the sealing surfaces.



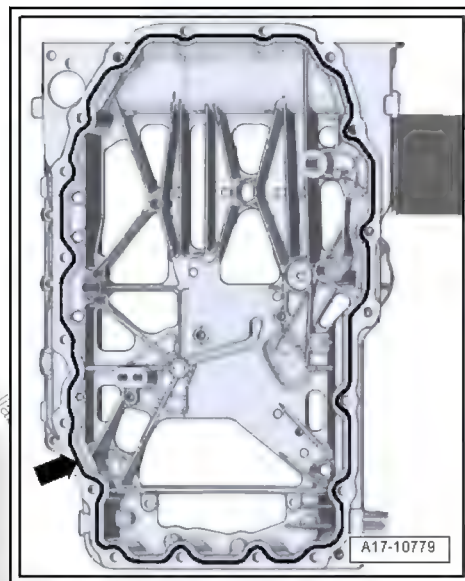
#### Note

Be sure to check the expiration date of the sealant.



- Cut the tube nozzle at the front marking (nozzle diameter: about 2 mm).





Apply a sealant bead -arrow- to the clean sealing surface on the upper section of the oil pan as shown.

Do not apply sealant bead thicker than indicated.

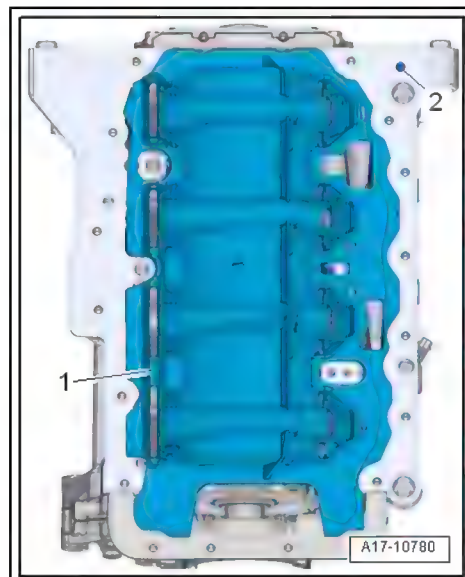
Sealant bead thickness: 2 to 3 mm.



#### Note

*Install the upper section of the oil pan within five minutes of applying the sealant.*

- Make sure the alignment pin -2- is secure in the cylinder block.

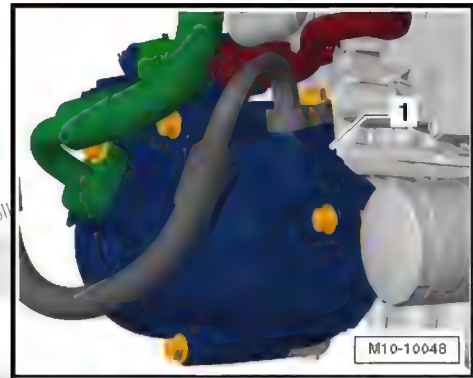


- Place the oil baffle -1- on the cylinder block.
- Position the oil pan upper section and tighten the bolts. Refer to ➔ [Fig. "Oil Pan Upper Section - Tightening Specifications and Sequence"](#), page 239.

Install in reverse order of removal. Note the following:

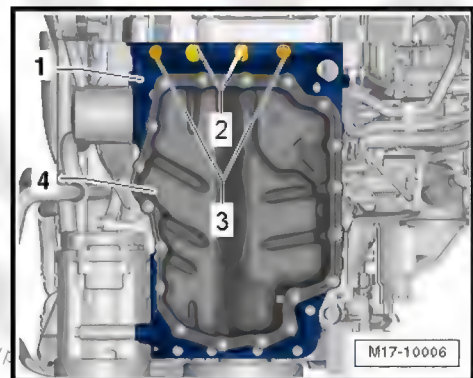


- Install the oil pump. Refer to ➔ [P1.5 ump, Removing and Installing", page 253](#) .
- Install the Electrical A/C Compressor -V470-. Refer to ➔ Heating, Ventilation and Air Conditioning; Rep. Gr. 87; A/C Compressor



#### Note

- ♦ *There is a risk of damaging the A/C compressor, the refrigerant lines and hoses.*
- ♦ *Do not bend, twist or stretch the refrigerant lines and hoses.*
- Install the plugs -2 and 3-



- Attach the Electric Drive Motor -V141- to the engine. Refer to ➔ [D1.3 rive MotorV141, Separating from Engine", page 29](#) .
- Connect the transmission to the engine. Refer to ➔ Rep. Gr. 34; Transmission, Removing and Installing; Transmission, Installing.

#### DANGER

**Extremely dangerous due to high-voltage.**

**Severe bodily injury or death by electrocution is possible.**

- Have a qualified person put the high-voltage system back into service.
- Bring the high-voltage system back into operation. Refer to ➔ Electrical Equipment; Rep. Gr. 93; High-Voltage System, Re-energizing.
- Install the engine. Refer to ➔ [I1.6 nstalling", page 65](#) .

- Fill the engine oil and check the oil level. Refer to ⇒ Maintenance; Booklet .

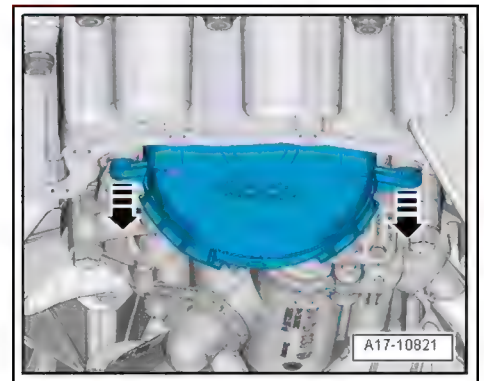
### Tightening Specifications

- ◆ Refer to ⇒ [-1.1 Oil Pan/Oil Pump”, page 236](#)
- ◆ Transmission, Installing. Refer to ⇒ Rep. Gr. 34; Transmission, Removing and Installing; Transmission, Installing

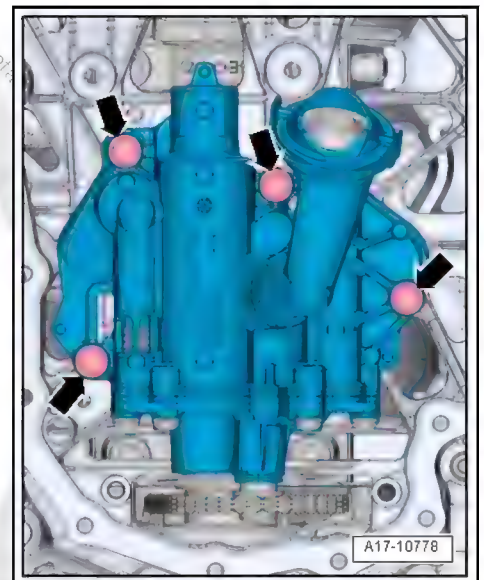
## 1.5 Oil Pump, Removing and Installing

### Removing

- Remove the oil pan lower section. Refer to ⇒ [P1.3 an Lower Section, Removing and Installing”, page 240](#) .
- Remove the cover from the oil pump drive chain sprocket in direction of -arrows-.



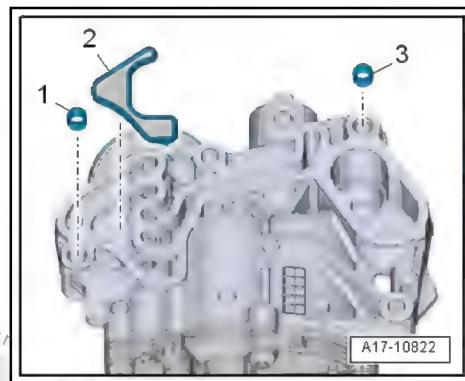
- Remove the bolts -arrows-.



- Guide the oil pump and drive chain sprocket out under the drive chain.

### Installing

- Make sure the alignment sleeves -1 and 3- are installed in the oil pump.
- Insert the seals and strainer -2- in the oil pump.



Install in the reverse order of removal while noting the following:

- Turn the oil pump drive chain sprocket and make sure the oil pump moves easily.



#### Note

*Replace the oil pump if it does not move easily.*

- Install the oil pump and drive chain sprocket in the drive chain and tighten.
- Install the oil pan lower section. Refer to ⇒ [P1.3 an Lower Section, Removing and Installing](#), page 240 .
- Fill the engine oil and check the oil level. Refer to ⇒ Maintenance; Booklet

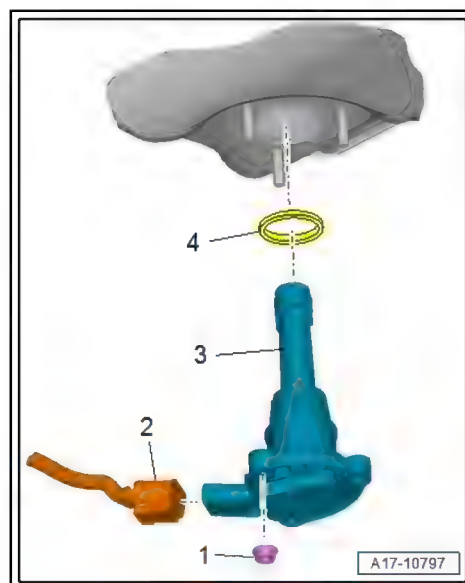
#### Tightening Specifications

- ◆ Refer to ⇒ [-1.1 Oil Pan/Oil Pump](#), page 236

## 1.6 Oil Level Thermal Sensor -G266-, Removing and Installing

### Removing

- Drain the engine oil.
- Disconnect the connector -2-.







- Remove the nuts -1- and the Oil Level Thermal Sensor -G266- -3-.

### Installing

Install in the reverse order of removal while noting the following:



#### Note

*Replace the seal -2-.*

- Fill the engine oil and check the oil level. Refer to ⇒ Maintenance; Booklet .

### Tightening Specifications

- ◆ Refer to ⇒ [-1.1 Oil Pan/Oil Pump", page 236](#)





## 2 Engine Oil Cooler

⇒ -2.1 Engine Oil Cooler", page 256

⇒ O2.2 il Cooler, Removing and Installing", page 256

### 2.1 Overview - Engine Oil Cooler

#### 1 - Engine Oil Cooler

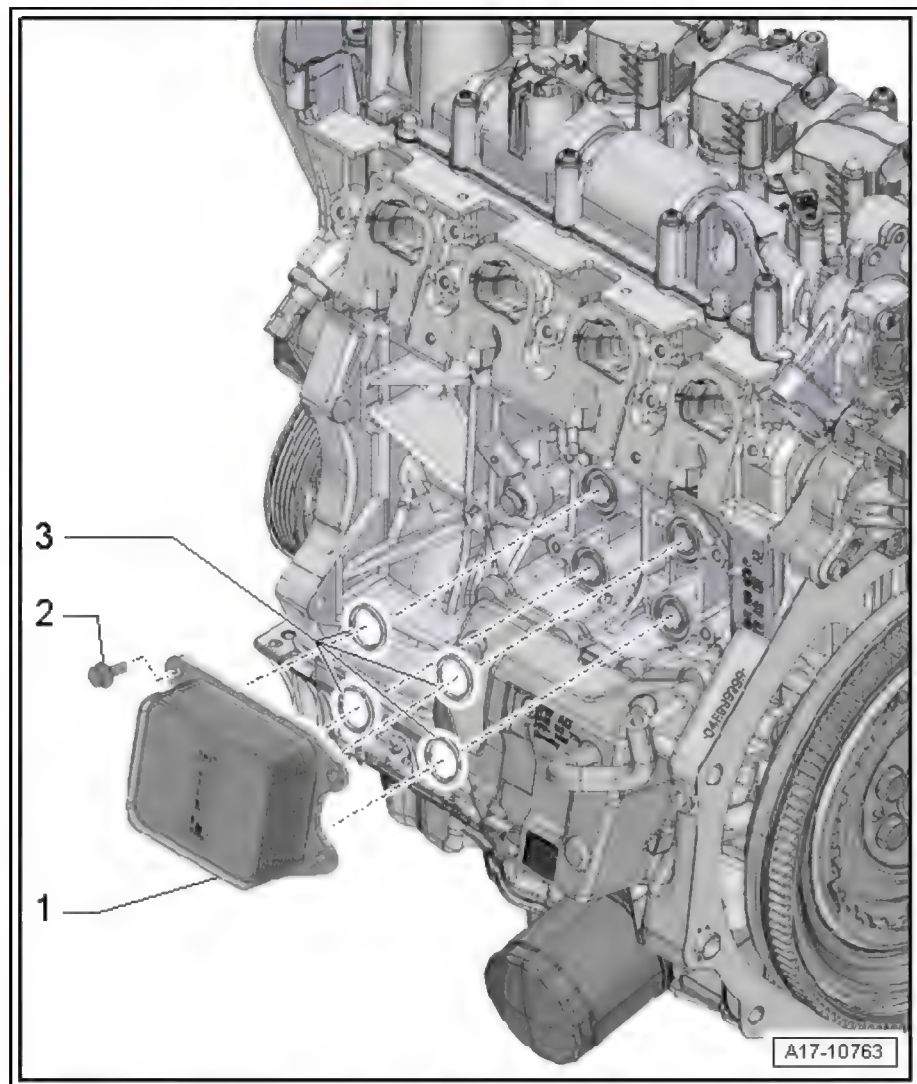
- ☐ See note. Refer to ⇒ [P1 an/Oil Pump", page 236](#) .
- ☐ Removing and Installing. Refer to ⇒ [O2.2 il Cooler, Removing and Installing", page 256](#) .
- ☐ Fill the coolant after replacing. Refer to ⇒ [page 279](#) .

#### 2 - Bolt

- ☐ 8 Nm +90°
- ☐ Replace after removing

#### 3 - Seals

- ☐ Replace after removing

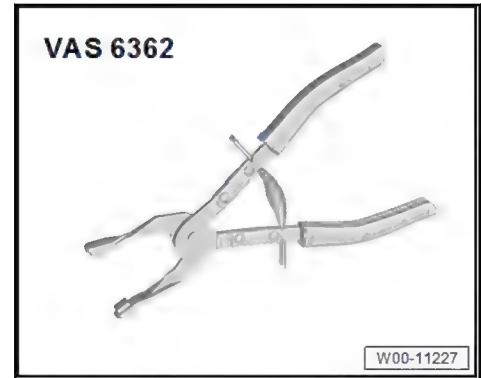


### 2.2 Engine Oil Cooler, Removing and Installing

Special tools and workshop equipment required

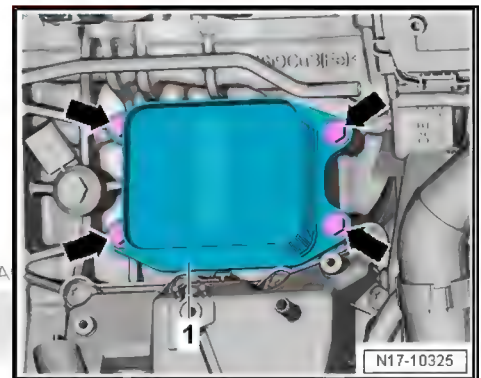


- ◆ Hose Clip Pliers -VAS 6362-



### Removing

- Drain the coolant. Refer to ⇒ [D1.3 draining and Filling](#)", page [275](#) .
- Remove the intake manifold. Refer to ⇒ [M3.2 anifold, Removing and Installing](#)", page [376](#) .
- Remove the bolts -arrows- and remove the engine oil cooler -1-.



### Installing

- Insert new seals.

Install in the reverse order of removal while noting the following:

- Install the intake manifold. Refer to ⇒ [M3.2 anifold, Removing and Installing](#)", page [376](#) .
- Fill the coolant. Refer to ⇒ [page 263](#) .

### Tightening Specifications

- ◆ Refer to ⇒ [-2.1 Engine Oil Cooler](#)", page [256](#)
- ◆ Refer to ⇒ [-1.1 Ignition System](#)", page [429](#)



### 3 Crankcase Ventilation

⇒ -3.1 Crankcase Ventilation", page 258

⇒ S3.2 eparator, Removing and Installing", page 259

#### 3.1 Overview - Crankcase Ventilation

##### 1 - Hose

- ☐ For the crankcase ventilation

##### 2 - Cover

- ☐ For the oil separator

##### 3 - Oil Separator

- ☐ Replace if damaged
- ☐ Removing and Installing. Refer to ⇒ [S3.2 eparator, Removing and Installing", page 259](#) .

##### 4 - Seal

- ☐ Replace after removing

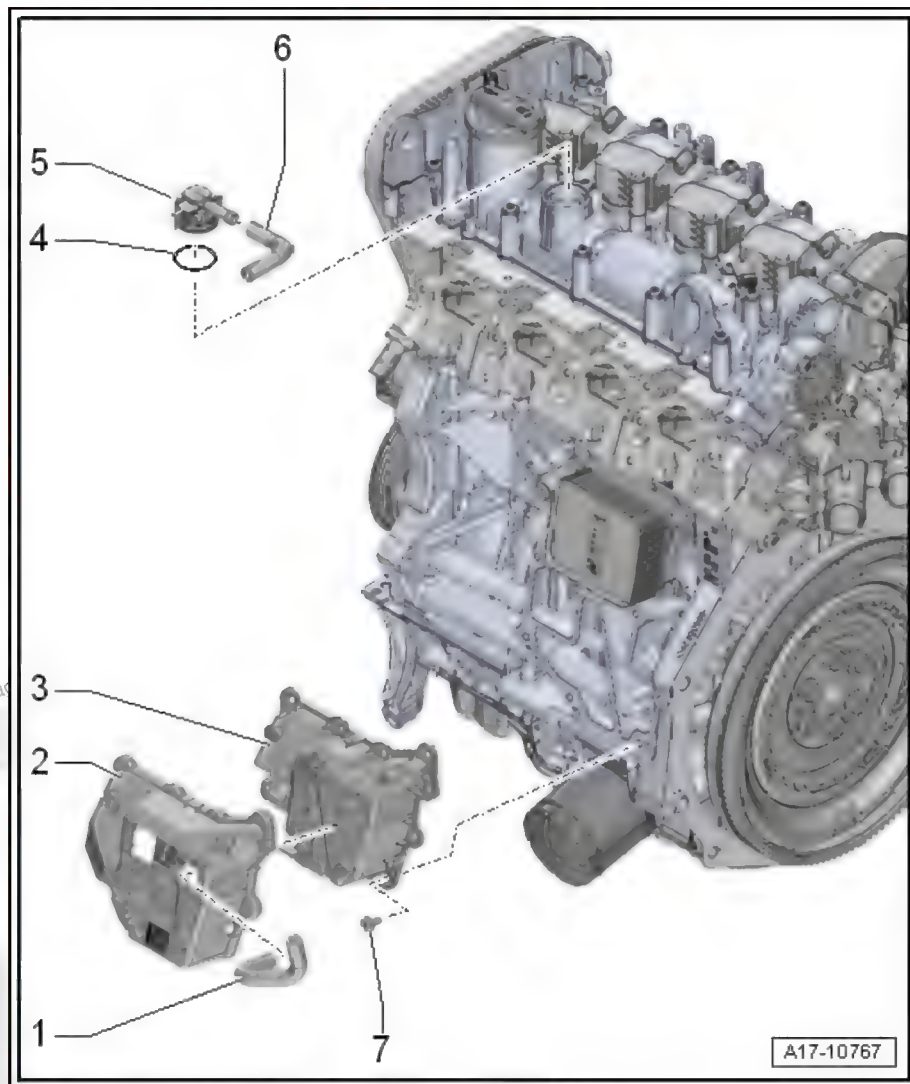
##### 5 - Connection

##### 6 - Hose

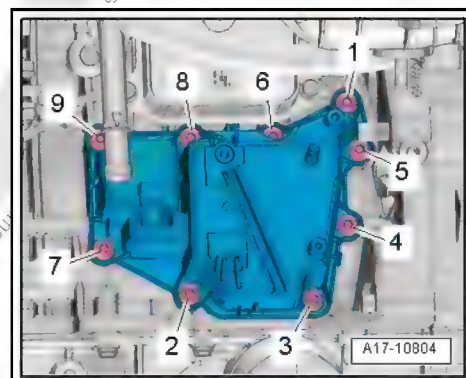
- ☐ For the crankcase ventilation

##### 7 - Bolt

- ☐ Replace after removing
- ☐ Tightening specification and sequence. Refer to ⇒ [Fig. "Oil Separator - Tightening Specification and Sequence" page 258](#) .
- ☐ Self-locking



#### Oil Separator - Tightening Specification and Sequence







- Tighten the bolts in the sequence -1 through 9-.

Component	Tightening Specification
Bolts -1 through 9-	9 Nm

### 3.2 Oil Separator, Removing and Installing

Special tools and workshop equipment required

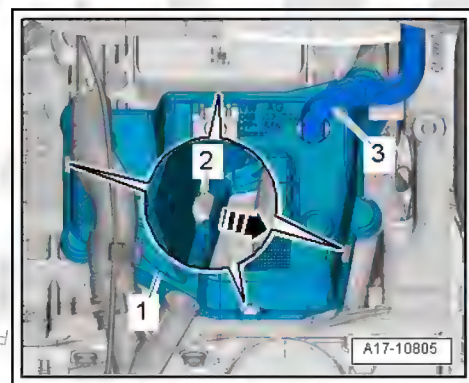
- ◆ Applicator Gun -VAS 6966-



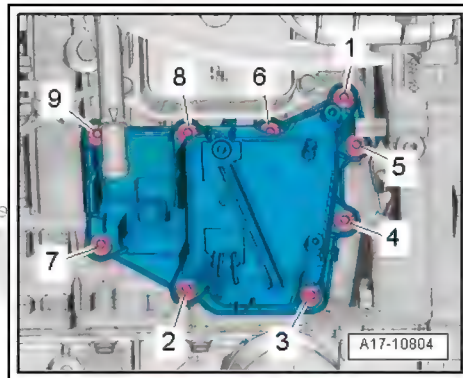
- ◆ Flat-Blade Scraper
- ◆ Two M6 x 20 mm stud bolts (commercially available)
- ◆ Sealant Remover
- ◆ Refer to the ⇒ Electronic Parts Catalog (ETKA) for the correct sealant.

#### Removing

- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 66; Noise Insulation; Noise Insulation, Removing and Installing.
- Remove the hose -3- for the crankcase ventilation.



- Release the cover -1- for the oil separator at the retainers -2- in direction of -arrow- and remove it.
- Loosen and remove the bolts in the following sequence:  
-9 to 1-.

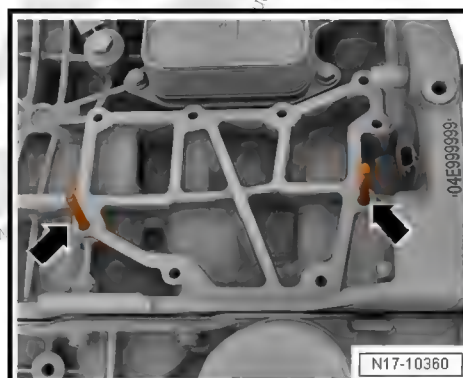


- Carefully loosen the oil separator from the adhesive.

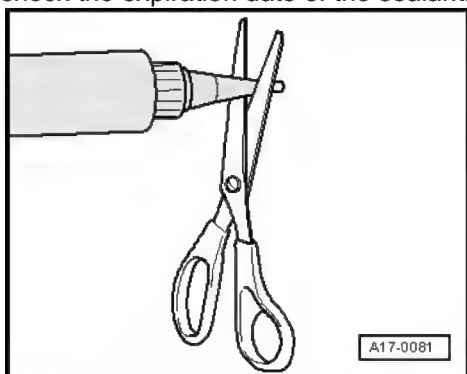
#### Installing

Install in the reverse order of removal while noting the following:

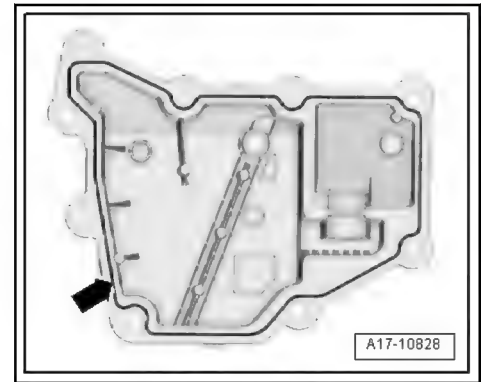
- Risk of contaminating the lubricating system
- Cover open engine components.
- Remove any sealant residue on the cylinder block using a flat blade scraper.
- Clean any oil or grease off the sealing surfaces.
- Install only a few threads of the two M 6 x 20 mm stud bolts in the holes -arrows-



- Be sure to check the expiration date of the sealant.



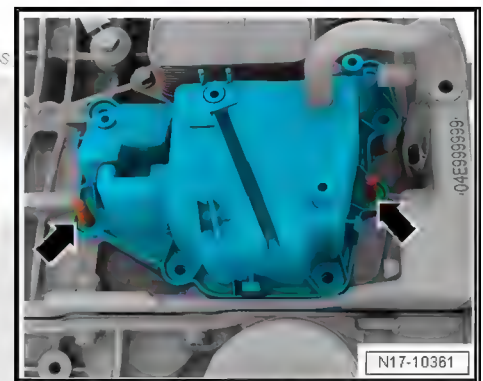
- Cut the tube nozzle at the front marking (nozzle diameter: about 2.0 mm).



- Apply the sealant bead -arrow- using the Applicator Gun -VAS 6966- on the clean sealing surface of the oil separator, as shown.
- Do not apply sealant bead thicker than indicated.
- Sealant bead thickness: 2.0 mm

Install the oil separator within five minutes of applying the sealant.

- Place the oil separator on the stud bolts -arrows- and push onto the crankcase.



- Install the securing bolts.
- Remove the stud bolts.
- Install the oil separator and tighten the bolts. Refer to ⇒ [Fig. "Oil Separator - Tightening Specification and Sequence", page 258](#).

Install in reverse order of removal. Note the following:

- Install the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 66; Noise Insulation; Noise Insulation, Removing and Installing.

#### Tightening Specifications

- ◆ Refer to ⇒ [Fig. "Oil Separator - Tightening Specification and Sequence", page 258](#)
- ◆ Refer to ⇒ [-2.2 Electric Coolant Pump", page 290](#)



## 4 Oil Filter/Oil Pressure Switch

⇒ 4.1 Oil Filter/Oil Pressure Switch", page 262

⇒ O4.2 il Pressure SwitchF22, Removing and Installing", page 263

⇒ R4.3 educed Oil Pressure SwitchF378, Removing and Installing", page 265

⇒ P4.4 ressure, Checking", page 266

⇒ O4.5 il Pressure Regulation ValveN428, Removing and Installing", page 268

### 4.1 Overview - Oil Filter/Oil Pressure Switch





**1 - Oil Filter**

- ☐ 20 Nm
- ☐ See note. Refer to [page 236](#).

**2 - Reduced Oil Pressure Switch -F378-**

- ☐ 20 Nm
- ☐ Switching pressure 0.3 to 0.6 bar (4.35 to 8.7 psi)
- ☐ Check using the Vehicle Diagnostic Tester Refer to [P4.4 Pressure, Checking](#), page 266.
- ☐ Removing and installing. Refer to [R4.3 Reduced Oil Pressure Switch F378, Removing and Installing](#), page 265.

**3 - Seal**

- ☐ Replace after removing
- ☐ The oil pressure switch is sealed off with a permanent seal
- ☐ The seal cannot be used multiple times

**4 - Seal**

- ☐ Replace after removing

**5 - Oil Pressure Regulation Valve -N428-**

- ☐ Removing and Installing. Refer to [O4.5 Oil Pressure Regulation Valve N428, Removing and Installing](#), page 268.

**6 - Bolt**

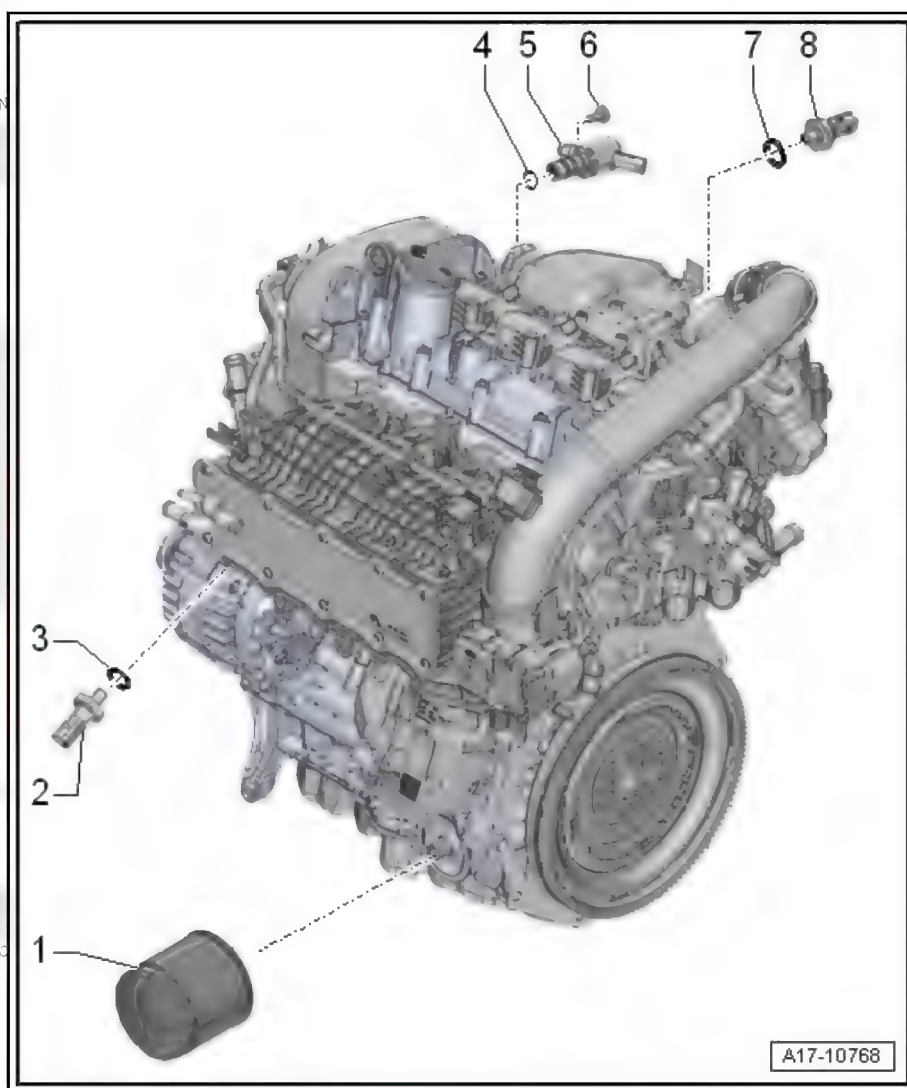
- ☐ 8 Nm

**7 - Seal**

- ☐ Replace after removing
- ☐ The oil pressure switch is sealed off with a permanent seal
- ☐ The seal cannot be used multiple times

**8 - Oil Pressure Switch -F22-**

- ☐ 20 Nm
- ☐ Switching pressure 2.15 to 2.95 bar (31.18 to 42.79 psi)
- ☐ Check using the Vehicle Diagnostic Tester Refer to [P4.4 Pressure, Checking](#), page 266.
- ☐ Removing and installing. Refer to [O4.2 Oil Pressure Switch F22, Removing and Installing](#), page 263.

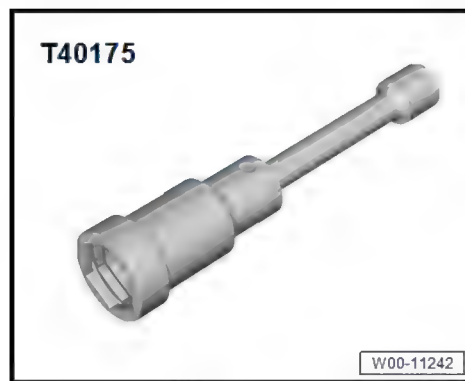


## 4.2 Oil Pressure Switch -F22-, Removing and Installing

Special tools and workshop equipment required



◆ Socket and Jointed Extension - 24mm -T40175-



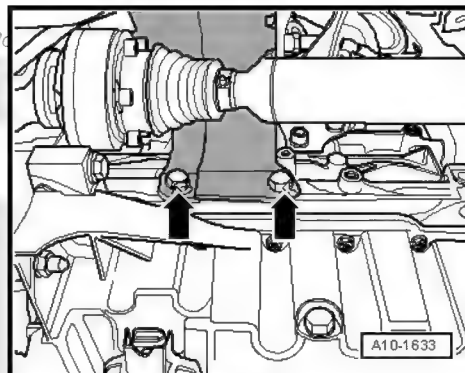
Removing



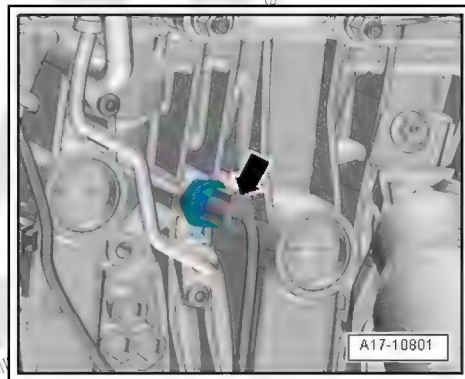
Note

*During installation, all heat shield boots must be installed at the same location.*

- Remove the noise insulation. Refer to ➤ Body Exterior; Rep. Gr. 66; Noise Insulation; Noise Insulation, Removing and Installing.
- Remove the bolts -arrows- and remove the right drive axle heat shield.



- Remove the heat shield boot.
- Disconnect the connector -arrow-.



**Note**

*Place a cloth underneath to catch any escaping engine oil.*

- Remove the Oil Pressure Switch -F22-.

**Installing**

Install in the reverse order of removal while noting the following:

**Note**

- ◆ *The oil pressure switch is sealed off with a permanent seal.*
- ◆ *The seal cannot be used multiple times.*
- Replace the oil pressure switch seal after removing -item 7-  
⇒ [Item 7 \(page 263\)](#) . Allocation. Refer to the ⇒ Electronic  
Parts Catalog (ETKA).
- Cut the seal to replace it.
- To prevent oil loss, immediately install the oil pressure  
switch in the opening.
- Check the oil level. Refer to ⇒ Maintenance; Booklet .

**Tightening Specifications**

- ◆ Refer to ⇒ [-4.1 Oil Filter/Oil Pressure Switch- page 262](#)
- ◆ Overview - Drive Axle. Refer to ⇒ Suspension, Wheels,  
Steering; Rep. Gr. 40; Drive Axle; Overview - Drive Axle.

### 4.3 Reduced Oil Pressure Switch -F378-, Removing and Installing

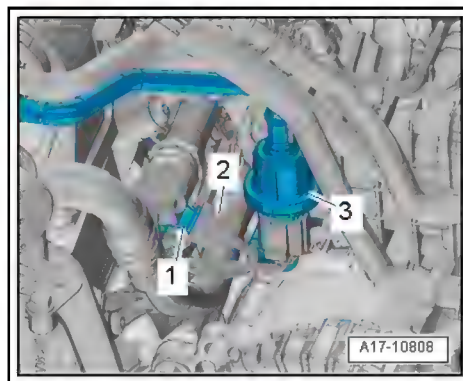
**Special tools and workshop equipment required**

- ◆ Socket and Jointed Extension - 24mm -T40175-





## Removing



- Remove the EVAP Canister Purge Regulator Valve 1 -N80-3- from the intake manifold and push it down slightly.
- Disconnect the connector -2-.



### Note

*Place a cloth underneath to catch any escaping engine oil.*

- Remove the Reduced Oil Pressure Switch -F378- -1- using the Socket and Jointed Extension - 24mm -T40175-.

## Installing

Install in the reverse order of removal while noting the following:



### Note

- ◆ *The oil pressure switch is sealed off with a permanent seal.*
- ◆ *The seal cannot be used multiple times.*
- Replace the oil pressure switch seal after removing -item 3- ➔ **Item 3 (page 263)** . Allocation. Refer to the ➔ Electronic Parts Catalog (ETKA).
- Cut the seal to replace it.
- To prevent oil loss, immediately install the oil pressure switch in the opening.
- Check the oil level. Refer to ➔ Maintenance; Booklet .

## Tightening Specifications

- ◆ Refer to ➔ **-4.1 Oil Filter/Oil Pressure Switch-, page 262**

## 4.4 Oil Pressure, Checking

Special tools and workshop equipment required







◆ Oil Pressure Gauge Kit -V.A.G 1342-



**Procedure**

- Check if oil level is OK. Refer to ⇒ Maintenance; Booklet .
- The engine oil temperature at least 80 °C (176 °F) (the radiator fan must start up once).
- Remove the Reduced Oil Pressure Switch -F378-. Refer to ⇒ [R4.3 educed Oil Pressure SwitchF378, Removing and Installing”, page 265](#) .
- Install the Oil Pressure Gauge Kit -V.A.G 1342- in the opening for the oil pressure switch.
- Install the Reduced Oil Pressure Switch -F378- in the hole on the Oil Pressure Gauge Kit -V.A.G 1342- to seal it.
- Start the engine.
- Oil pressure at idle: minimum 0.6 bar (8.7 psi).
- Oil pressure at 2,000 RPM: minimum 1.5 bar (21.76 psi).
- Oil pressure at 4,500 RPM: minimum 2.8 bar (40.61 psi).

If the specified value is not obtained:

- Check the Oil Pressure Regulation Valve -N428- with the ⇒ Vehicle diagnostic tester.



**Note**

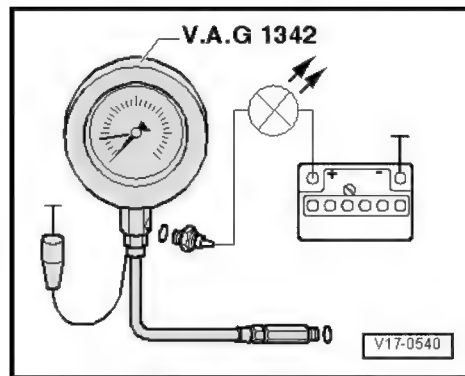
*Also, mechanical damage, for example bearing damage can also be the cause of too low oil pressure.*

If no error can be found:

- Replace the oil pump. Refer to ⇒ [P15 ump, Removing and Installing”, page 253](#) .

**Checking the Reduced Oil Pressure Switch -F378- (brown):**

- Turn off the engine.
- Connect the brown wire on the tester to the ground (-).



- Connect the Hybrid Voltage Tester -VAS 6839- to the battery positive (+) and Reduced Oil Pressure Switch -F378- (brown) using the adapter cables from the Connector Test Set - V.A.G 1594D-.

- The LED must not turn on.

- If the LED illuminates, replace the Reduced Oil Pressure Switch -F378-.

If the LED does not turn on:

- Start the engine: the LED must turn on at 0.3 to 0.6 bar (4.35 to 8.7 psi) pressure, otherwise replace the oil pressure switch.

#### Checking the Oil Pressure Switch -F22- (blue):

- Turn off the engine.
- Connect the Hybrid Voltage Tester -VAS 6839- to the battery positive (+) and Oil Pressure Switch -F22- (blue) using the adapter cables from the Connector Test Set - V.A.G 1594D-.
- The LED must not turn on.
- If the LED illuminates, replace the Oil Pressure Switch -F22-.

If the LED does not turn on:

- Start the engine and increase the RPM. The LED must turn on at 2.15 to 2.95 bar (31.18 to 42.79 psi) pressure. If not, replace the oil pressure switch.
- Install the Reduced Oil Pressure Switch -F378-. Refer to [⇒ R4.3 Reduced Oil Pressure Switch F378, Removing and Installing](#), page 265 .

#### Tightening Specifications

- ♦ Refer to [⇒ -4.1 Oil Filter/Oil Pressure Switch](#), page 262

## 4.5 Oil Pressure Regulation Valve -N428-, Removing and Installing

### Removing



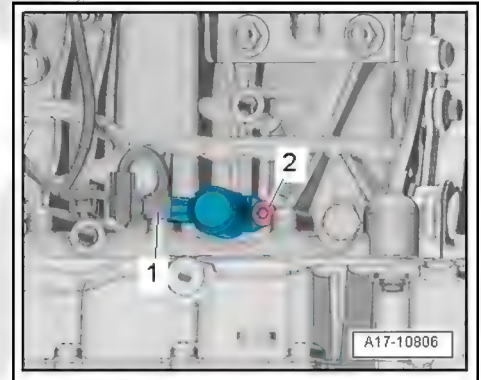
#### Note

*During installation, all heat shield boots must be installed at the same location.*

- Remove the noise insulation. Refer to [⇒ Body Exterior; Rep. Gr. 66; Noise Insulation; Noise Insulation, Removing and Installing](#).
- Remove the heat insulation sleeves.



- Disconnect the connector -1-.



#### Note

*Place a cloth underneath to catch any escaping engine oil.*

- Remove the bolt -2- and remove the Oil Pressure Regulation Valve -N428-.

#### Installing

Install in the reverse order of removal while noting the following:



#### Note

*The seal cannot be replaced separately.*

- Check the seal for damage. If necessary, replace it with the Oil Pressure Regulation Valve -N428-.
- Install the noise insulation. Refer to ➔ Body Exterior; Rep. Gr. 66; Noise Insulation; Noise Insulation, Removing and Installing.

#### Tightening Specifications

- ◆ Refer to ➔ [-4.1 Oil Filter/Oil Pressure Switch", page 262](#)



## 19 – Cooling System

### 1 Cooling System/Coolant

⇒ [D1.1 Diagram - Coolant Hoses](#), page 270

⇒ [S1.2 System, Checking for Leaks](#), page 272

⇒ [D1.3 Draining and Filling](#), page 275

#### 1.1 Connection Diagram - Coolant Hoses



##### Note

- ◆ *Blue = small engine coolant system.*
- ◆ *Green = low temperature coolant circuit.*
- ◆ *Red = high temperature circuit.*
- ◆ *The arrows show the coolant flow direction.*



**1 - Coolant Expansion Tank****2 - Cap**

- ☐ For the coolant reservoir
- ☐ Check the pressure relief valve. Refer to [page 275](#).

**3 - Cylinder Head/Cylinder Block**

- ☐ Fill the coolant after replacing. Refer to [page 279](#).

**4 - Turbocharger**

- ☐ Removing and Installing. Refer to [R1.2 removing and Installing](#), page 331.

**5 - Electric Drive Motor - V141-**

- ☐ Removing and Installing. Refer to [R1.2 removing and Installing](#), page 8.

**6 - Heater Core for the Heater**

- ☐ Fill the coolant after replacing. Refer to [page 279](#).

**7 - High Temperature Circuit Coolant Pump -V467-**

- ☐ Removing and Installing. Refer to [H2.4.2 High Temperature Circuit Coolant Pump V467, Removing and Installing](#), page 295.

- ☐ It is located at the back of the transmission near the vacuum pump.

**8 - Electric Drive Power and Control Electronics -JX1-****9 - Coolant Pump**

- ☐ With the coolant thermostat housing
- ☐ Removing and Installing. Refer to [P2.5 ump, Removing and Installing](#), page 297.

**10 - Radiator**

- ☐ High temperature circuit
- ☐ Fill the coolant after replacing. Refer to [page 279](#).

**11 - Integrated exhaust manifold**

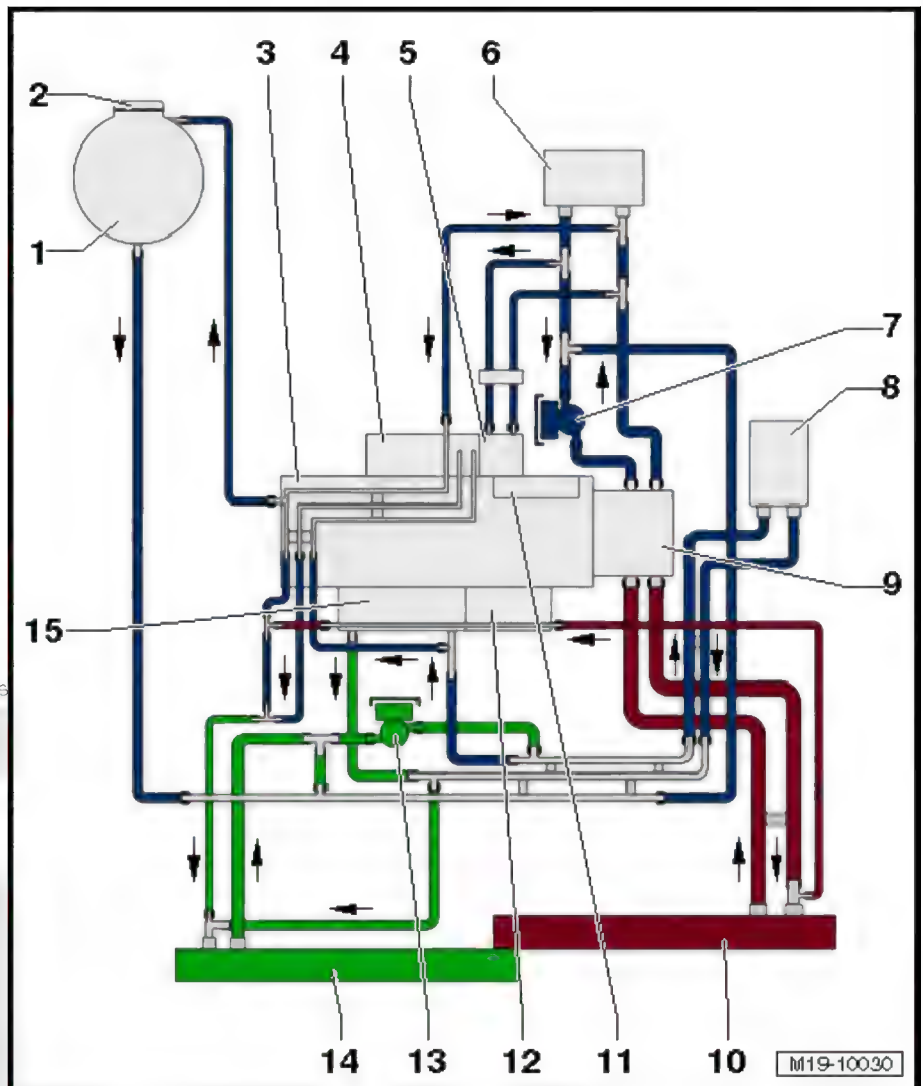
- ☐ integrated in cylinder head

**12 - Engine Oil Cooler****13 - Low Temperature Circuit Coolant Pump -V468-**

- ☐ Removing and Installing. Refer to [C2.4 oolant Pump, Removing and Installing](#), page 292.

**14 - Radiator**

- ☐ Low temperature coolant circuit
- ☐ Fill the coolant after replacing. Refer to [page 279](#).

**15 - Charge Air Cooler Inside the Intake Manifold**



- ❑ Fill the coolant after replacing. Refer to ➔ [page 279](#) .

## 1.2 Cooling System, Checking for Leaks

Special tools and workshop equipment required

- ◆ Cooling System Tester -V.A.G 1274 B-



- ◆ Cooling System Tester - Adapter -V.A.G 1274/8-



- ◆ Cooling System Tester - Adapter -V.A.G 1274/9-



### Procedure

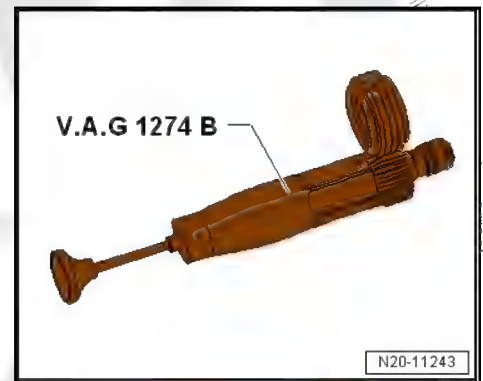


#### Note

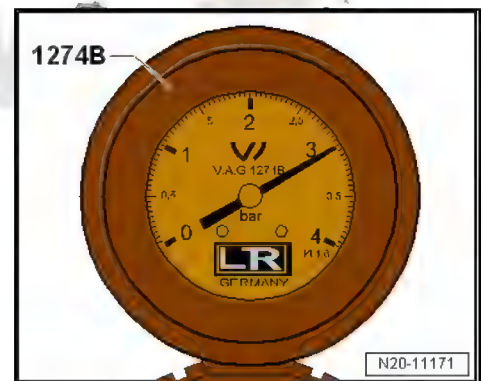
*To perform the leak test correctly, a check (self-test) of the Cooling System Tester -V.A.G 1274 B- must be performed first.*



## Cooling System Tester -V.A.G 1274 B- Checking (Self-Test)



- Operate the Cooling System Tester -V.A.G 1274 B- multiple times.
- Create a pressure of 3.0 bar (43.51 psi) on the Cooling System Tester.



- Observe the pressure on the pressure gauge of the Cooling System Tester for 30 seconds.

### If No Pressure is Built or the Pressure Decreases:

The Cooling System Tester -V.A.G 1274 B- is leaking and must not be used.

### Cooling System, Checking for Leaks

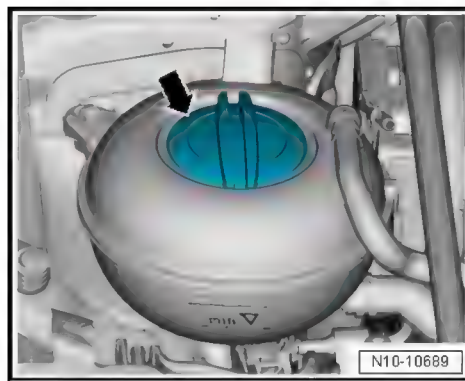
#### CAUTION

The cooling system may be under pressure. There is a risk of scalding due to hot steam and hot coolant.

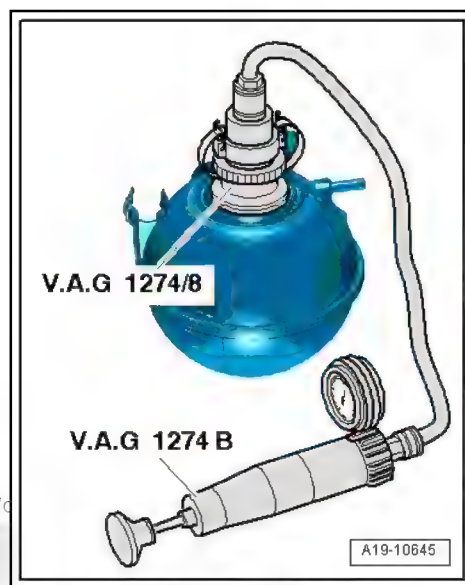
Scalding the skin and other parts of the body is possible.

- Wear safety gloves.
- Wear protective eyewear.
- Reduce the pressure by covering the coolant expansion tank cap with a suitable towel and carefully opening it.

- Open the coolant reservoir cap -arrow-.



- Engine at operating temperature.
- Position the Cooling System Tester -V.A.G 1274 B- with the Cooling System Tester - Adapter -V.A.G 1274/8- on the coolant expansion tank.



- Generate approximately 1.5 bar (21.76 psi) pressure using the cooling system tester hand pump.
- The pressure must not drop more than 0.2 bar (2.9 psi) within 10 minutes.
- If the pressure falls more than 0.2 bar (2.9 psi), search for leaks and correct the problem.



#### Note

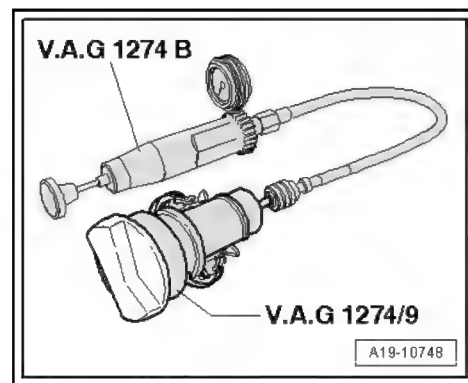
*The pressure decrease of 0.2 bar (2.9 psi) within 10 minutes is a condition of the cooling of the coolant. The colder the engine the more the pressure decrease. If necessary repeat the test with the engine cold.*







## Pressure Relief Valve in Cap, Checking



- Position the Cooling System Tester -V.A.G 1274 B- with the Cooling System Tester - Adapter -V.A.G 1274/9- on the cap.
- Generate pressure with the cooling system tester hand pump.
- ◆ The pressure release valve must open at 1.4 to 1.6 bar (20.31 to 23.21 psi).

## 1.3 Coolant, Draining and Filling



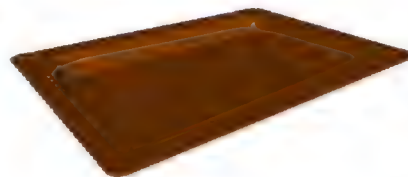


**Special tools and workshop equipment required**

**T10007 A**



**VA S 6208**



**VA S 6340**



**VA S 6096**

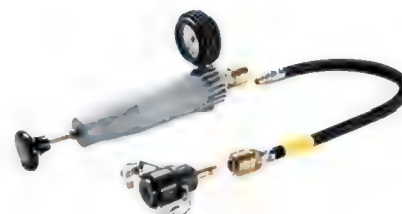


**V.A.G 1274/8**



W19-10066

**V.A.G 1274 B**



W00-11247

- ◆ Refractometer -T10007A-
- ◆ Shop Crane - Drip Tray -VAS 6208-
- ◆ Hose Clip Pliers -VAS 6340-
- ◆ Cooling System Charge Kit -VAS 6096-
- ◆ Cooling System Tester - Adapter -V.A.G 1274/8-
- ◆ Protective Eyewear
- ◆ Safety Gloves

◆ Cooling System Tester -V.A.G 1274 B-

Draining

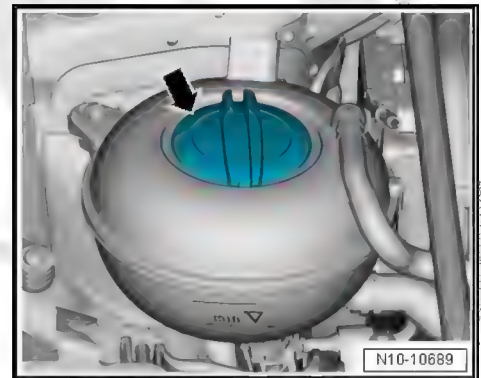
**CAUTION**

The cooling system may be under pressure. There is a risk of scalding due to hot steam and hot coolant.

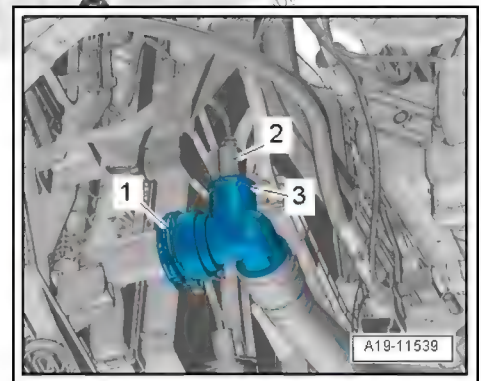
Scalding the skin and other parts of the body is possible.

- Wear safety gloves.
- Wear protective eyewear.
- Reduce the pressure by covering the coolant expansion tank cap with a suitable towel and carefully opening it.

- Open the coolant reservoir cap -arrow-



- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 66; Noise Insulation; Noise Insulation, Removing and Installing.
- Place the Shop Crane - Drip Tray -VAS 6208- underneath.
- Disconnect the connector -2- on the Engine Coolant Temperature Sensor on Radiator Outlet -G83- -3-



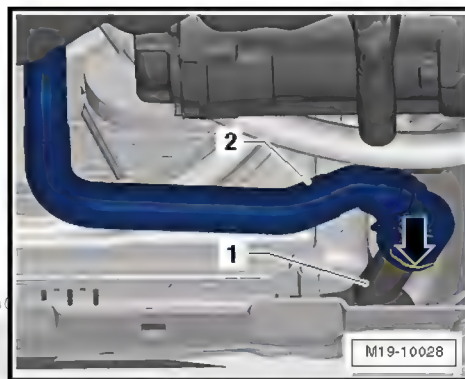
- Lift the clamp -1-, remove the lower left coolant hose from the radiator and drain the coolant.



**Note**

*Drained coolant must be stored in a clean container for disposal or reuse.*

- Lift the clamp -arrow-, remove the lower right coolant hose -2- from the charge air cooling circuit cooler -1- and drain the coolant.





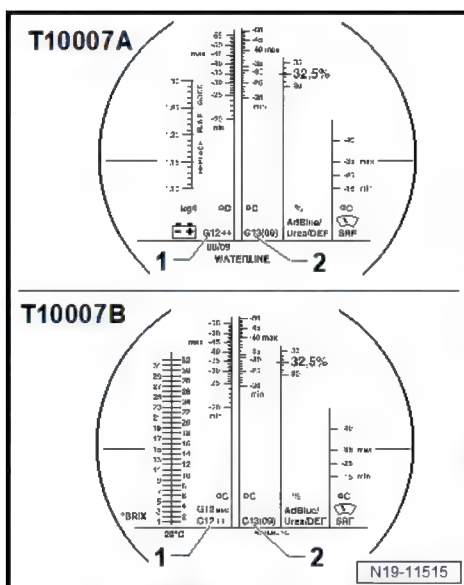


## Filling



**Note**

- ◆ *Distilled water must be used to mix the coolant concentrate due to country and region specific differences in the contents in tap water.*
- ◆ *Only use coolant additives approved for the vehicle. Refer to ⇒ Electronic Parts Catalog (ETKA). Other coolant additives may above all reduce the corrosion protection effect significantly. The damage resulting from this may lead to loss of coolant and consequently to severe engine damage.*
- ◆ *Coolant with the correct mixture ratio prevents freezing and corrosion damage and calcium deposits. Additionally, the boiling temperature will be raised. For this reason the cooling system must be filled with coolant additive year-round.*
- ◆ *Because of its high boiling point, the coolant contributes to engine reliability under heavy engine loads, particularly in countries with tropical climates.*
- ◆ *To determine the current freeze protection value, use the Refractometer -T10007A- or Analog Refractometer -T10007B-.*



- ◆ *The scale -1- on the refractometer refers to the coolant additives G12++ and G12evo.*
- ◆ *The scale -2- on the refractometer refers to the coolant additive G13.*
- ◆ *If the type of coolant additive cannot be determined, always use the G13 scale to determine freeze protection.*
- ◆ *Freeze protection must be assured down to minimum -25 °C (-13 °F) (in arctic climatic countries down to approximately -36 °C (-32.8 °F)). The freeze protection may only be increased, when stronger freeze protection is needed due to the climate. But only down to -48 °C (-54.4 °F), otherwise the effectiveness of the coolant decreases.*
- ◆ *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. The frost protection must be at least -25 °C (-13 °F).*
- ◆ *The temperature on the Refractometer corresponds to the »freezing point«. At this temperature, ice crystals may begin to form in the coolant.*

- ◆ *Used coolant cannot be used again.*
- ◆ *Only use water/coolant additive to lubricate the coolant hoses.*

### Coolant Mixture Ratio

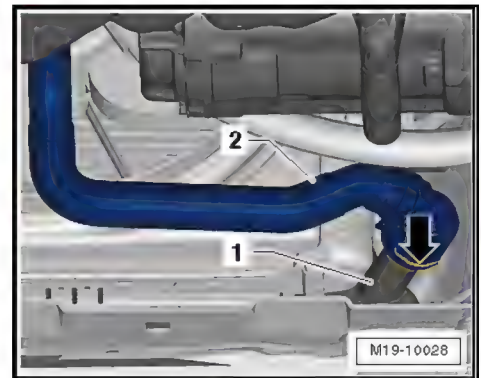
Frost Protection to	Portion of Coolant Additive	Coolant Additive <sup>1)</sup>	Distilled Water <sup>1)</sup>
-25 °C (-13 °F)	40 %	3.2L	4.8L
-36 °C (-32.8 °F)	50 %	4.0L	4.0L

1) The amount of coolant may vary depending on vehicle equipment.

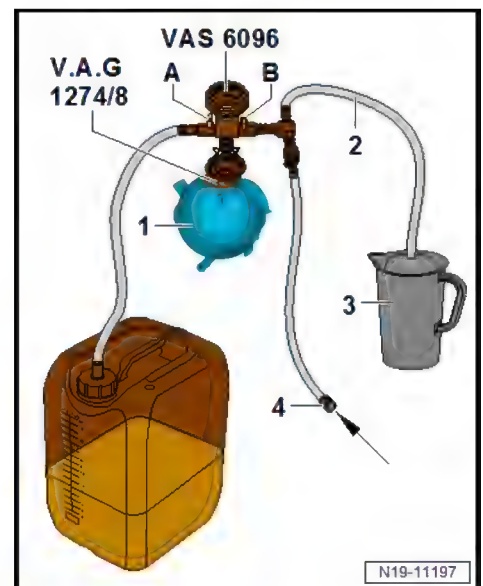
- Refer to the ⇒ Electronic Parts Catalog (ETKA) for the correct coolant.

### Procedure

- Attach the coolant hose with the connector coupling to the lower left side of the radiator. Refer to ⇒ [Fig. "Connect the Coolant Hose to the Connector Coupling", page 321](#) .
- Install the lower right coolant hose to the charge air cooling circuit cooler.



- Fill the coolant reservoir on the Cooling System Charge Kit -VAS 6096- with at least ten liters of premixed coolant with the proper mixture ratio:





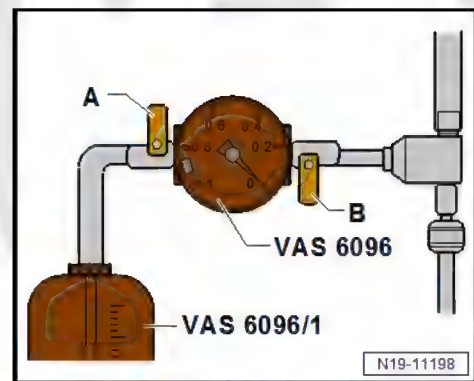
- Install the Cooling System Tester - Adapter -V.A.G 1274/8- on the coolant expansion tank.
- Mount the Cooling System Charge Kit -VAS 6096- on the Cooling System Tester - Adapter -V.A.G 1274/8-.
- Place the drain hose -1- in a small container -2-.



#### Note

*A small amount of coolant which should be collected is drawn off with the discharged air.*

- Close the valves -A and B- by turning lever at a right angle to the flow direction.
- Connect the hose -3- to compressed air.
- Pressure: 6 to 10 bar (87.02 to 145.04 psi) positive pressure.
- Open the valve -B- by turning the lever in the flow direction.



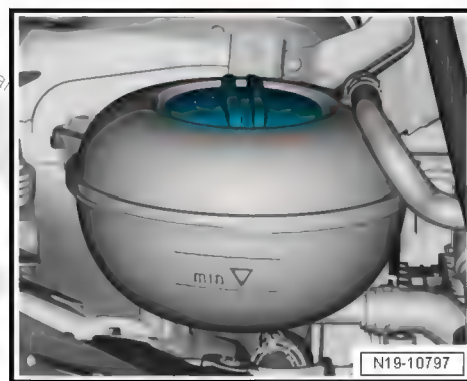
- A further vacuum is created in the cooling system by the suction jet pump.
- The needle on the instrument display must travel into the green region.
- Open the valve -A- for a moment.
- To do so, turn the lever in the flow direction so that the hose on the Cooling System Charge Kit - Reservoir -VAS 6096/1- fills with coolant.
- Close the valve -A- again.
- Leave the valve -B- open another two minutes.
- A further vacuum is created in the cooling system by the suction jet pump.
- Needle on the instrument display must still remain in the green region.
- Close the valve -B-.
- Needle in the display instrument must remain in the green region, then the sufficient vacuum in the cooling system is obtained for the upcoming filling.




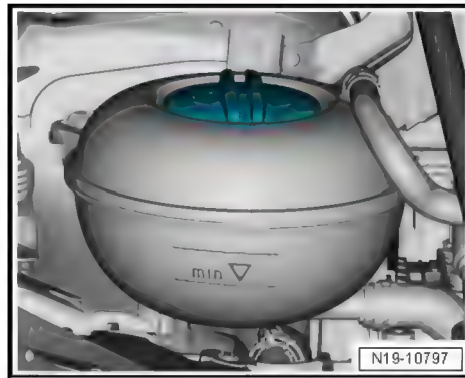


## Note

- ◆ *Repeat the procedure if the needle goes below the green range.*
- ◆ *Check the cooling system for leaks if the pressure drops.*
- Remove the pressure hose.
- Open the valve -A-.
- Coolant is extracted from the Cooling System Charge Kit -VAS 6096- coolant expansion tank due to a vacuum in the coolant system and the system is filled.
- Remove the Cooling System Charge Kit -VAS 6096- from the coolant expansion tank.
- Fill the coolant up to the “MAX” mark.



- Install the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 66; Noise Insulation; Noise Insulation, Removing and Installing.
- If the vehicle has a parking heater, switch it on for about 30 seconds.
- Set the temperature to “HI”.
- Press the  button to turn off the A/C compressor.
- The LED in the button must not come on.
- Close the coolant expansion tank cap until it locks into place.
- Start the engine and allow it to run alternating between 1500 RPM up to maximum 2800 RPM until the radiator fan starts running.
- Turn off engine and allow it to cool off.
- Check the coolant level.



- The coolant level must be between the “min” and the “max” markings when the engine is cold.
- The coolant level may be at the “max” marking when the engine is warm.
- If necessary, fill the coolant again.





## 2 Coolant Pump/Coolant Thermostat

⇒ [-2.1 Coolant Pump/Coolant Thermostat", page 285](#)

⇒ [-2.2 Electric Coolant Pump", page 290](#)

⇒ [-2.3 Engine/Motor Coolant Temperature Sensor", page 291](#)

⇒ [C2.4 Coolant Pump, Removing and Installing", page 292](#)

⇒ [P2.5 Pump, Removing and Installing", page 297](#)

⇒ [T2.6 Thermostat, Removing and Installing", page 304](#)

⇒ [P2.7 Pump Toothed Belt Sprocket, Removing and Installing", page 308](#)

⇒ [E2.8 Engine Coolant Temperature Sensor G62, Removing and Installing", page 313](#)

⇒ [E2.9 Engine Coolant Temperature Sensor on Radiator Outlet G83, Removing and Installing", page 314](#)

### 2.1 Overview - Coolant Pump/Coolant Thermostat

⇒ [-2.1.1 Coolant Pump/Thermostat, Version 1", page 285](#)

⇒ [-2.1.2 Coolant Pump/Thermostat, Version 2", page 288](#)

#### 2.1.1 Overview - Coolant Pump/Thermostat, Version 1





## 1 - Coolant Thermostat Housing

- ❑ Removing and Installing. Refer to ➤ [T2.6 thermostat, Removing and Installing](#), page 304 .

## 2 - Coolant Thermostat

- ❑ For the cylinder block coolant circuit
- ❑ Starts to open at approximately 97 °C to 105 °C (206.6 °F to 221 °F)
- ❑ There are different versions. Refer to the ➤ Electronic Parts Catalog (ETKA).
- ❑ Removing and Installing. Refer to ➤ [T2.6 thermostat, Removing and Installing](#), page 304 .

## 3 - Seal

- ❑ Replace after removing

## 4 - Coolant Pump

- ❑ Removing and Installing. Refer to ➤ [P2.5 ump, Removing and Installing](#), page 297 .
- ❑ Replace the toothed belt also if replacing the coolant pump

## 5 - Bolt

- ❑ Thread cutting
- ❑ Position the bolt by hand and tighten it until it finds the old threads. Then tighten the bolt to the tightening specification
- ❑ Tightening specification and sequence. Refer to ➤ [Fig. "Thermostat Housing to Coolant Pump - Tightening Specification and Sequence"](#), page 287 .

## 6 - Seal

- ❑ Replace after removing

## 7 - Toothed Belt Guard

- ❑ For the coolant pump toothed belt

## 8 - Bolt

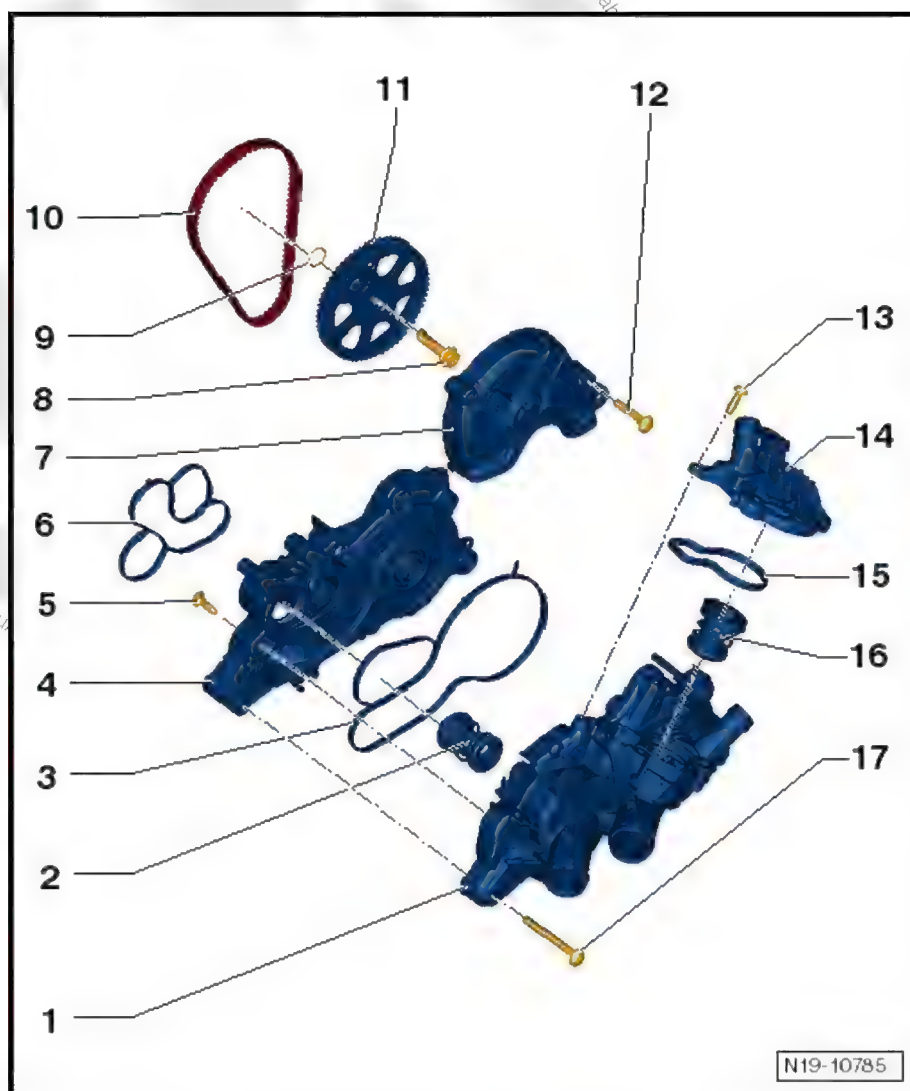
- ❑ 20 Nm +90°
- ❑ Replace after removing

## 9 - Seal

- ❑ Replace after removing
- ❑ Install only on version 1
- ❑ Removing and Installing. Refer to ➤ [P2.7 ump Toothed Belt Sprocket, Removing and Installing](#), page 308 .

## 10 - Toothed Belt

- ❑ For the coolant pump



- ☐ Replace the toothed belt also if replacing the coolant pump

#### 11 - Toothed Belt Sprocket

- ☐ For the coolant pump
- ☐ Removing and Installing. Refer to ⇒ [P2.7 ump Toothed Belt Sprocket, Removing and Installing", page 308](#) .

#### 12 - Bolt

- ☐ 8 Nm

#### 13 - Bolt

- ☐ Thread cutting
- ☐ Position the bolt by hand and tighten it until it finds the old threads. Then tighten the bolt to the tightening specification
- ☐ Tightening specification and sequence. Refer to ⇒ [Fig. ""Coolant Thermostat Cover to Coolant Thermostat Housing - Tightening Specification"" , page 288](#) .

#### 14 - Cap

- ☐ For the coolant thermostat

#### 15 - Seal

- ☐ Replace after removing

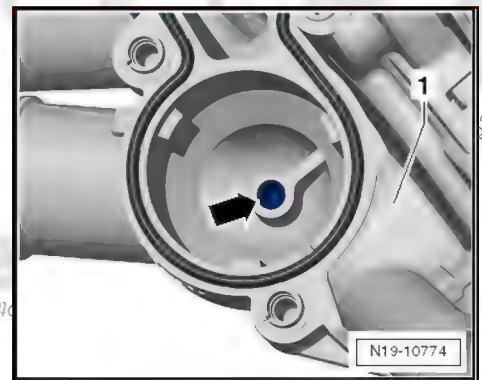
#### 16 - Coolant Thermostat

- ☐ For main coolant circuit (radiator)
- ☐ Through 11/2012: begins opening at approximately 80 °C (176 °F)
- ☐ From 11/2012: begins opening at approximately 87 °C (188.6 °F)
- ☐ Removing and Installing. Refer to ⇒ [P2.6 hermostat, Removing and Installing", page 304](#) .
- ☐ Installation position. Refer to ⇒ [Fig. ""Large Engine Coolant System Coolant Thermostat Installed Location"" , page 287](#) .

#### 17 - Bolt

- ☐ Tightening specification and sequence. Refer to ⇒ [page 302](#) .

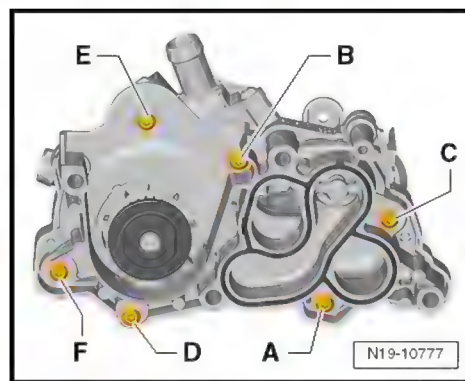
#### Large Engine Coolant System Coolant Thermostat Installed Location



- Must fit in the thermostat housing with the centering pin inside the guide -arrow-.

#### Thermostat Housing to Coolant Pump - Tightening Specification and Sequence



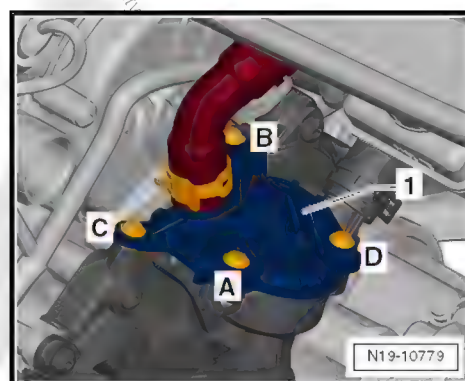


- Tighten bolts in the sequence -A through F-.

#### Tightening Specifications

Component	Tightening Specification
Bolts -A through F-	8 Nm

#### Coolant Thermostat Cover to Coolant Thermostat Housing - Tightening Specification



- Tighten the bolts for the cover -1- in the sequence  
-A through D-.

#### Tightening Specifications

Component	Tightening Specification
Bolts -A through D-	8 Nm

### 2.1.2 Overview - Coolant Pump/Thermostat, Version 2

**1 - Camshaft Housing**

- ☐ Removing and Installing. Refer to ⇒ [H1.4 ousing, Removing and Installing", page 157](#) .

**2 - Toothed Belt**

- ☐ Replace with replacing the coolant pump
- ☐ For the coolant pump drive
- ☐ Removing and Installing. Refer to ⇒ [P2.7 ump, Toothed Belt Sprocket, Removing and Installing", page 308](#) .

**3 - Camshaft Sprocket**

- ☐ For the coolant pump drive

**4 - Bolt**

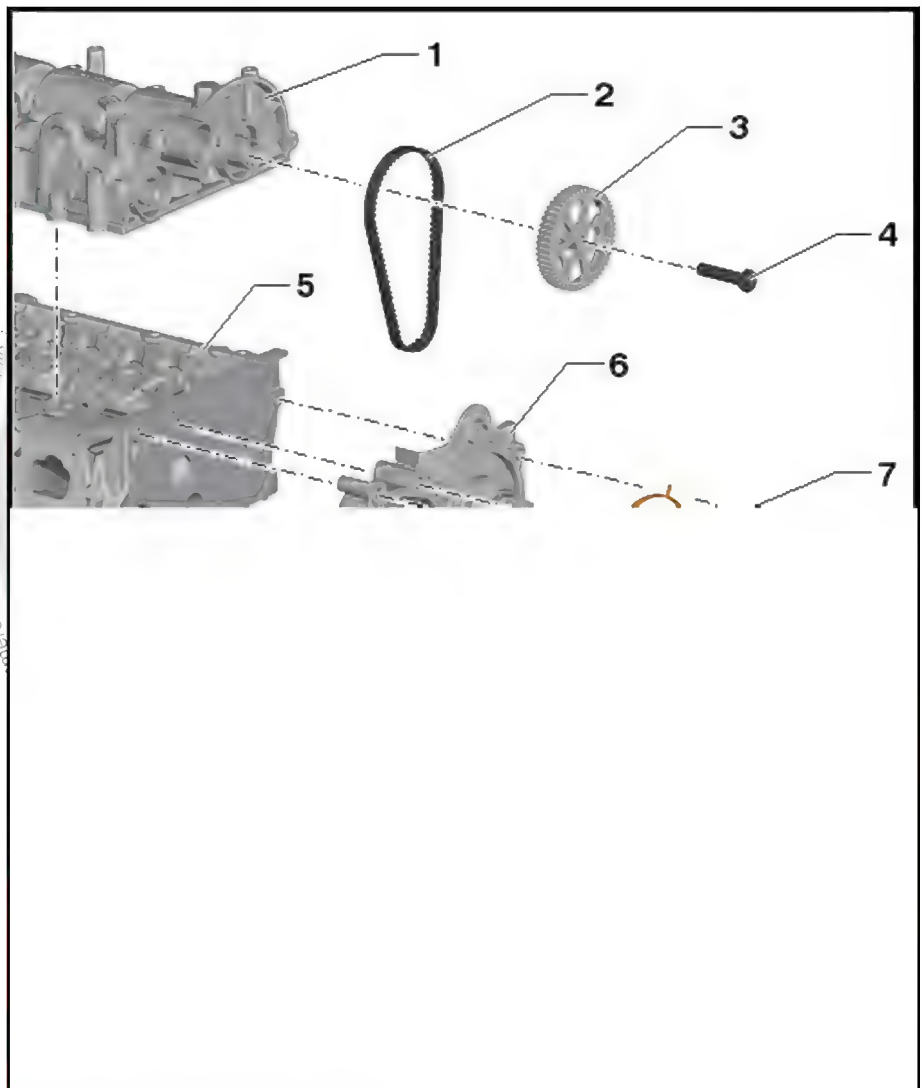
- ☐ 20 Nm

**5 - Cylinder Head**

- ☐ Removing and Installing. Refer to ⇒ [H1.3 ead, Removing and Installing", page 152](#) .

**6 - Coolant Pump**

- ☐ Removing and Installing. Refer to ⇒ [P2.5 ump, Removing and Installing", page 297](#) .

**7 - Coolant Pump Housing/Coolant Thermostat Housing Seal**

- ☐ Replace after removing
- ☐ Make sure the seal fits correctly. Refer to ⇒ [Fig. "Install Position of the Seals", page 290](#) .
- ☐ Coat with coolant before installing

**8 - Coolant Thermostat Housing**

- ☐ Removing and Installing. Refer to ⇒ [T2.6 hermostat, Removing and Installing", page 304](#) .
- ☐ Pay attention to the tightening sequence on the coolant pump. Refer to ⇒ [Fig. "Tightening Sequence and Specification from the Coolant Thermometer Housing to the Coolant Pump", page 290](#) .

**9 - Bolts**

- ☐ Follow the tightening sequence. Refer to ⇒ [Fig. "Tightening Sequence and Specification from the Coolant Thermometer Housing to the Coolant Pump", page 290](#) .

**10 - Coolant Thermostat Housing Seal to Coolant Pump Housing**

- ☐ Replace after removing
- ☐ Make sure the seal fits correctly. Refer to ⇒ [Fig. "Install Position of the Seals", page 290](#) .
- ☐ Coat with coolant before installing

**11 - Coolant Thermostat**

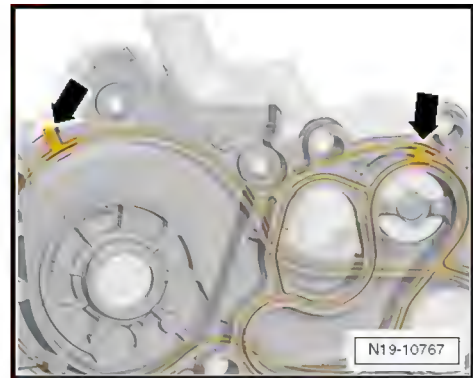
- ☐ Removing and Installing. Refer to ⇒ [T2.6 hermostat, Removing and Installing", page 304](#) .



#### Note

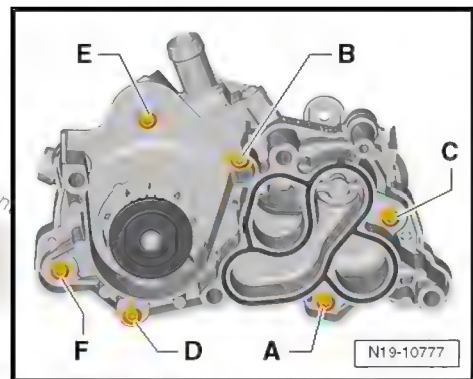
*Coolant Pump, Removing and Installing. Refer to ➤ [P2.5 ump, Removing and Installing](#), page 297.*

#### Install Position of the Seals



- Make sure they fit correctly -arrows-.

#### Tightening Sequence and Specification from the Coolant Thermometer Housing to the Coolant Pump



- Tighten the bolts in the following sequence: -A through F-.

Component	Tightening Specification
Bolts -A through F-	12 Nm

## 2.2 Overview - Electric Coolant Pump



**1 - Coolant Hose**

- ☐ To the Low Temperature Circuit Coolant Pump -V468-

**2 - Bolt**

- ☐ 10 Nm
- ☐ Pump to bracket

**3 - Bolt**

- ☐ 20 Nm
- ☐ Low Temperature Circuit Coolant Pump - V468- bracket to engine

**4 - Bolt**

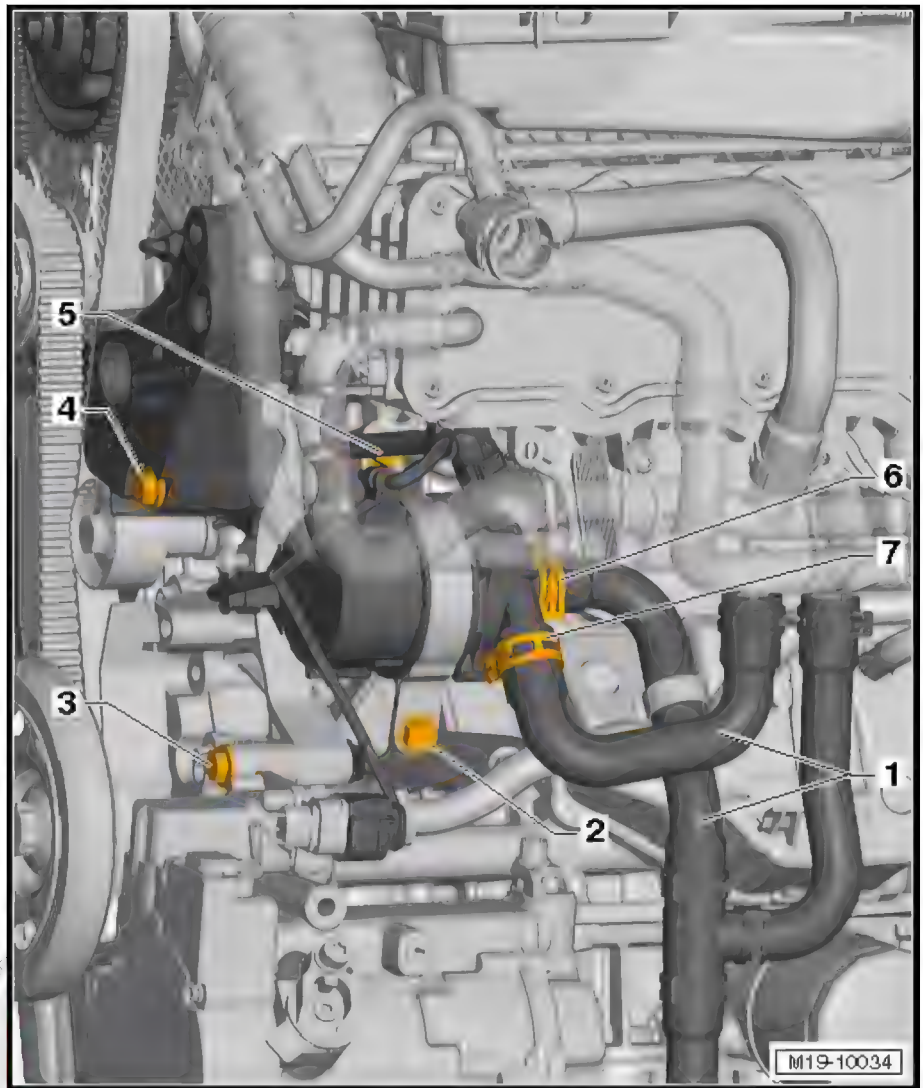
- ☐ 20 Nm
- ☐ Low Temperature Circuit Coolant Pump - V468- bracket to engine mount bracket

**5 - Bolt**

- ☐ 10 Nm
- ☐ Pump to bracket

**6 - Spring Clamp****7 - Low Temperature Circuit Coolant Pump -V468-**

- ☐ With bracket
- ☐ Removing and Installing. Refer to ➔ [C2.4 Coolant Pump, Removing and Installing, page 292](#).

**2.3 Overview - Engine/Motor Coolant Temperature Sensor**





**1 - Seal**

- ☐ Replace after removing

**2 - Engine Coolant Temperature Sensor on Radiator Outlet -G83-**

- ☐ Removing and Installing. Refer to ➤ [E2.9 Engine Coolant Temperature Sensor on Radiator Outlet G83, Removing and Installing](#), page 314 .

**3 - Support Ring**

**4 - Seal**

- ☐ Replace after removing

**5 - Engine Coolant Temperature Sensor -G62-**

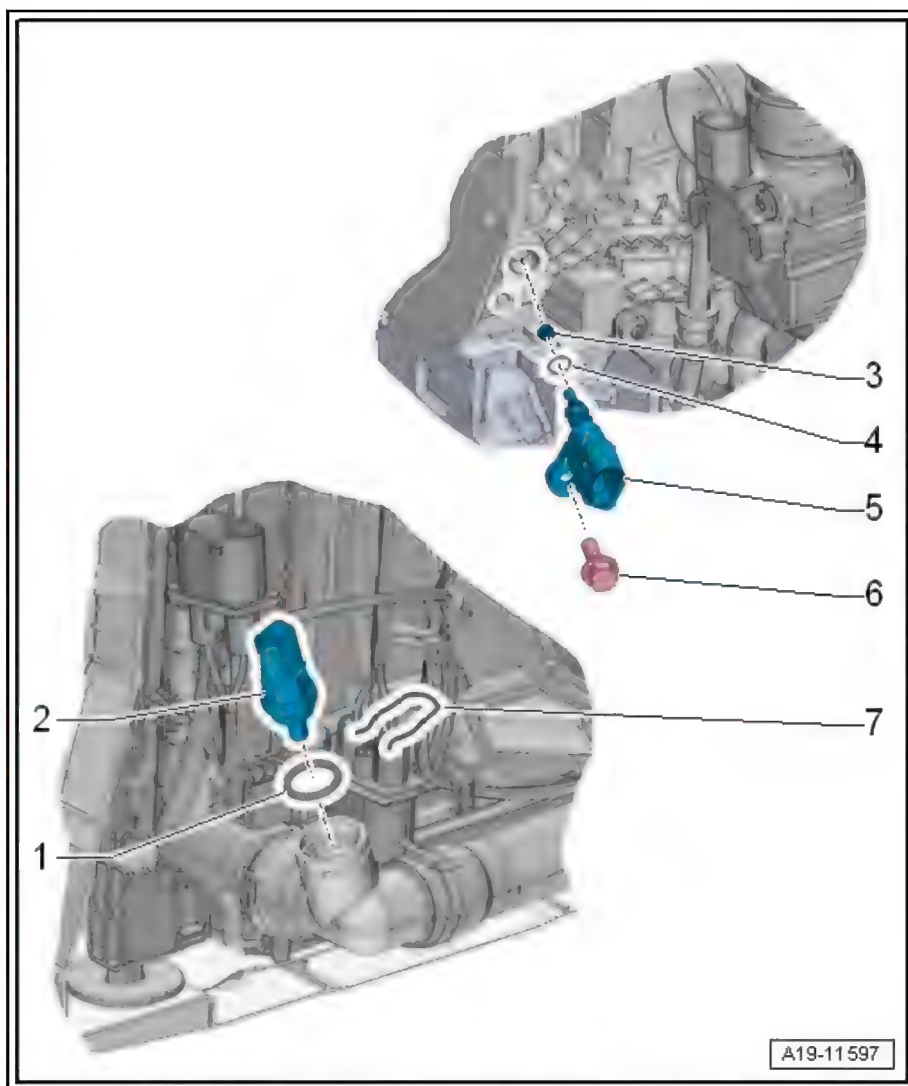
- ☐ Removing and Installing. Refer to ➤ [E2.8 Engine Coolant Temperature Sensor G62, Removing and Installing](#), page 313 .

**6 - Bolt**

- ☐ 8 Nm

**7 - Clip**

- ☐ Check for secure fit



## 2.4 Electric Coolant Pump, Removing and Installing

➤ [L2.4.1 Low Temperature Circuit Coolant Pump V468, Removing and Installing](#), page 292

➤ [H2.4.2 High Temperature Circuit Coolant Pump V467, Removing and Installing](#), page 295

### 2.4.1 Low Temperature Circuit Coolant Pump -V468-, Removing and Installing

Special tools and workshop equipment required





## 2.4.2 High Temperature Circuit Coolant Pump -V467-, Removing and Installing

Special tools and workshop equipment required

- ◆ Hose Clamps - Up To 25 mm -3094-



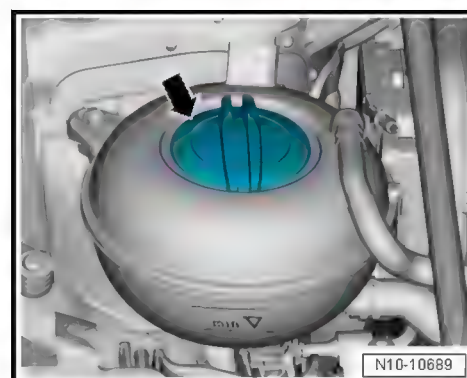
- ◆ Shop Crane - Drip Tray -VAS 6208-



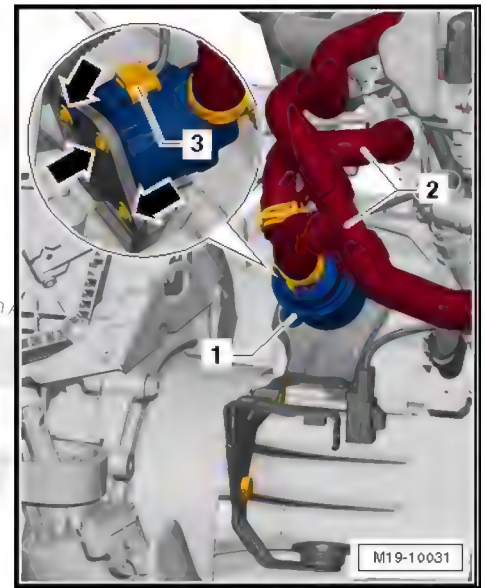
- ◆ Hose Clip Pliers -VAS 6362-



### Removing



- Remove the three bolts -arrows- for the High Temperature Circuit Coolant Pump -V467- -3-.



- Remove the High Temperature Circuit Coolant Pump -V467- from the bracket.

#### Installing

Install in the reverse order of removal while noting the following:

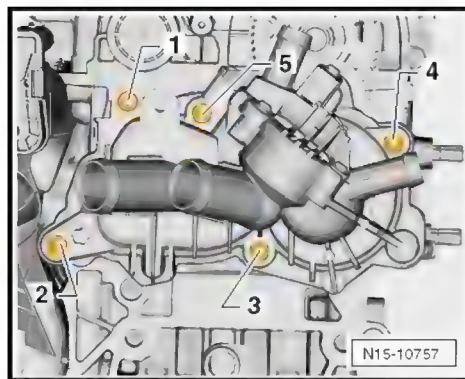
#### Note

- ◆ *Secure all hose connections with standard production hose clamps. Refer to the ➔ Electronic Parts Catalog (ETKA).*
- ◆ *Check the connection for the vacuum lines on the pump for leaks.*
- Install the noise insulation. Refer to ➔ Body Exterior; Rep. Gr. 66; Noise Insulation; Noise Insulation, Removing and Installing.
- Check the coolant level. Refer to ➔ [page 283](#)

#### Tightening Specifications

Component	Tightening Specification
High Temperature Circuit Coolant Pump -V467- bolts to bracket	3 Nm

## 2.5 Coolant Pump, Removing and Installing



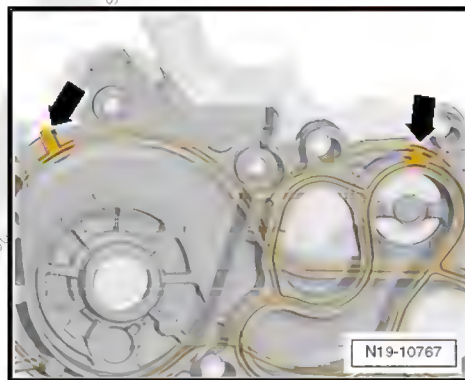
- Remove the coolant pump and coolant thermostat housing.
- Remove the coolant thermostat housing if the coolant pump is being replaced. Refer to ➔ [T2.6 thermostat, Removing and Installing](#), page 304 .

### Installing



#### Note

- ◆ *Replace the housing seal -arrows-.*
- ◆ *Replace the toothed belt as well if the coolant pump is being replaced.*
- ◆ *Secure hose connections with standard production clamps. Refer to the ➔ [Electronic Parts Catalog \(ETKA\)](#).*
- Make sure the seals fit correctly -arrows-.



- Coat the seal on the coolant pump with coolant.
- Turn cylinder 1 to TDC. Refer to ➔ [T2.5 Timing, Checking](#), page 177 .
- Lay the toothed belt in the center and move the coolant pump into its installed position.
- Position the coolant pump and bolts on the cylinder head.
- Pre-tighten the bolts in the specified sequence -1 through 5-:



Install in reverse order of removal. Note the following:

#### Vehicles with Secondary Air System

- Install the secondary air system bracket.
- Install the Electric Drive Power and Control Electronics - JX1-. Refer to ⇒ Electrical Equipment; Rep. Gr. 93; Electric Drive Power and Control Electronics; Electric Drive Power and Control Electronics, Removing and Installing.
- Install the Drive Motor High-Voltage Wiring Harness -PX2- on the Electric Drive Power and Control Electronics -JX1-. Refer to ⇒ Electrical Equipment; Rep. Gr. 93; High-Voltage Cables; Drive Motor High-Voltage Wiring Harness, Removing and Installing.

#### Continuation for All Vehicles

- Fill the coolant. Refer to ⇒ [page 279](#).



#### **DANGER**

**Extremely dangerous due to high-voltage.**

**Severe bodily injury or death by electrocution is possible.**

- Have a qualified person put the high-voltage system back into service.

- Bring the high-voltage system back into operation. Refer to ⇒ Electrical Equipment; Rep. Gr. 93; High-Voltage System, Re-energizing.

#### Tightening Specifications

- ♦ Coolant pump tightening sequence. Refer to ⇒ [page 302](#).
- ♦ Refer to ⇒ [-2.1 Charge Air System", page 345](#)
- ♦ Overview - battery. Refer to ⇒ Electrical Equipment; Rep. Gr. 27; Battery; Overview - Battery.

## 2.6 Coolant Thermostat, Removing and Installing

⇒ [T2.6.1 hermostat for Main Coolant Circuit \(Radiator\), Removing and Installing", page 304](#)

⇒ [T2.6.2 hermostat for Cylinder Block Coolant Circuit, Removing and Installing", page 307](#)

### 2.6.1 Coolant Thermostat for Main Coolant Circuit (Radiator), Removing and Installing

Special tools and workshop equipment required

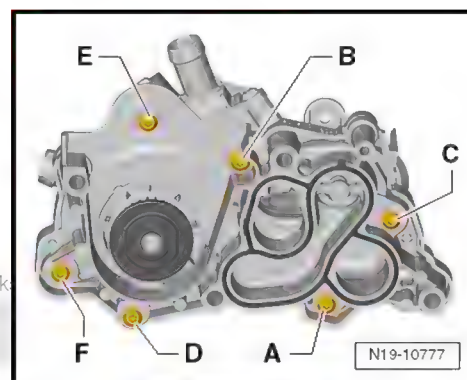
### Tightening Specifications

- ◆ Refer to ⇒ Fig. [“Coolant Thermostat Cover to Coolant Thermostat Housing - Tightening Specification”](#), page 288

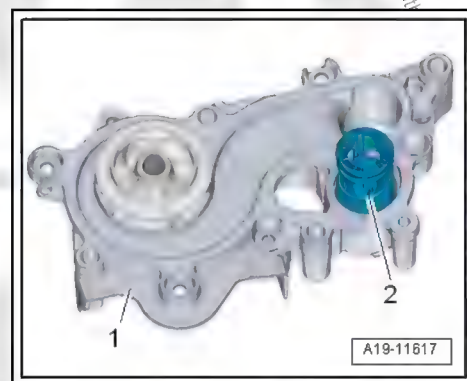
## 2.6.2 Coolant Thermostat for Cylinder Block Coolant Circuit, Removing and Installing

### Removing

- Remove the coolant pump. Refer to ⇒ [P2.5 ump, Removing and Installing](#), page 297 .
- Remove the bolts in the following sequence: -F through A-.



- Remove the coolant pump from the coolant thermostat housing.
- Remove the coolant thermostat **-2-** from the coolant pump **-1-**.



### Installing

Install in the reverse order of removal while noting the following:

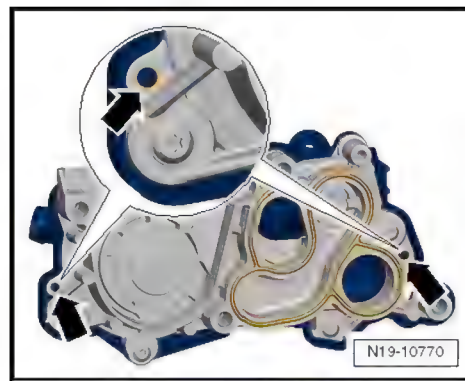


#### Note

*Replace the seal.*

- Coat the seal with coolant.
- Place the coolant thermostat housing on the coolant pump.





- The centering pins on the coolant thermostat must fit into the guides -arrows- on the coolant pump.
- Tighten the bolts on the coolant thermostat housing. Refer to [⇒ Fig. “Thermostat Housing to Coolant Pump - Tightening Specification and Sequence”, page 287](#) .
- Install the coolant pump. Refer to [⇒ P2.5 ump, Removing and Installing”, page 297](#) .
- Fill the coolant. Refer to [⇒ page 279](#) .

#### Tightening Specifications

- ◆ Refer to [⇒ Fig. “Thermostat Housing to Coolant Pump - Tightening Specification and Sequence”, page 287](#)

## 2.7 Coolant Pump Toothed Belt Sprocket, Removing and Installing

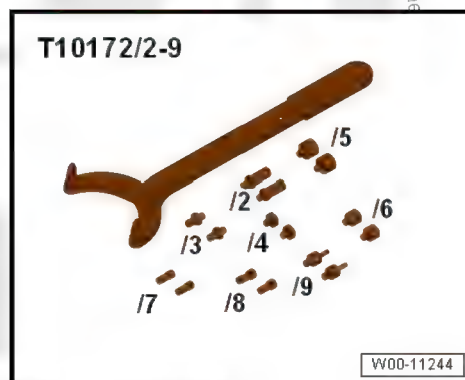
[⇒ P2.7.1 ump Toothed Belt Sprocket, Removing and Installing, Version 1”, page 308](#)

[⇒ P2.7.2 ump Toothed Belt Sprocket, Removing and Installing, Version 2”, page 311](#)

### 2.7.1 Coolant Pump Toothed Belt Sprocket, Removing and Installing, Version 1

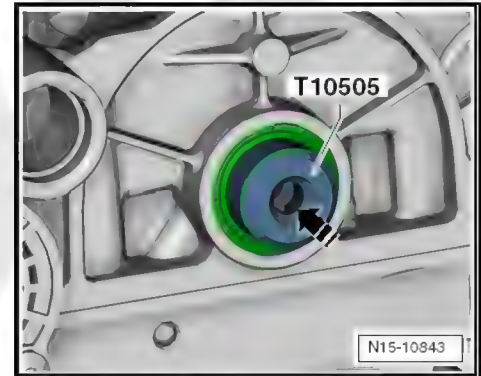
#### Special tools and workshop equipment required

- ◆ Counterhold - Multiple Use -T10172A- with Counterhold - Kit  
- Adapter 2 -T10172/2-





- Place the Seal Installer - Camshaft O-Ring -T10505- on the camshaft and slide it all the way in the direction of -arrow- by hand.



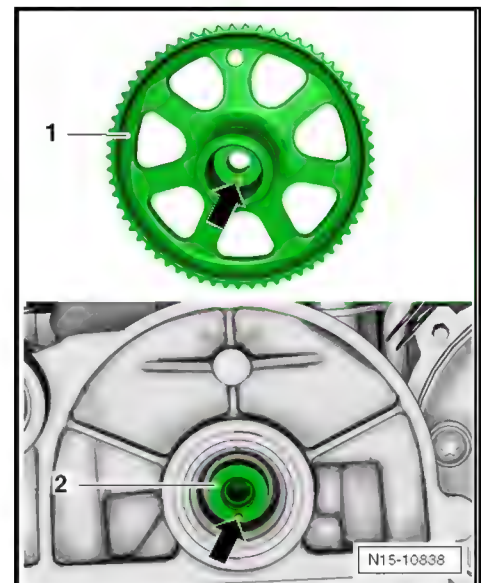
- Remove the Seal Installer - Camshaft O-Ring -T10505-.

The seal must rest in the camshaft groove.

### Installing

Installing the toothed belt sprocket:

- Mount the toothed belt sprocket -1- on the camshaft -2- so that the camshaft pin fits into the hole in the toothed belt sprocket -arrows-.



- Install the coolant pump. Refer to ⇒ [P2.5 ump, Removing and Installing](#), page 297 .

### Tightening Specifications

- ◆ Refer to ⇒ [-2.1 Coolant Pump/Coolant Thermostat](#), page 285

## 2.7.2 Coolant Pump Toothed Belt Sprocket, Removing and Installing, Version 2

Special tools and workshop equipment required

- The openings -arrows- in the toothed belt sprocket are likewise positioned asymmetrically.
- Place the toothed belt sprocket on the camshaft so the asymmetrical grooves are exactly in the center of the openings.
- Install the coolant pump. Refer to ➔ [P2.5 ump, Removing and Installing](#), page 297 .

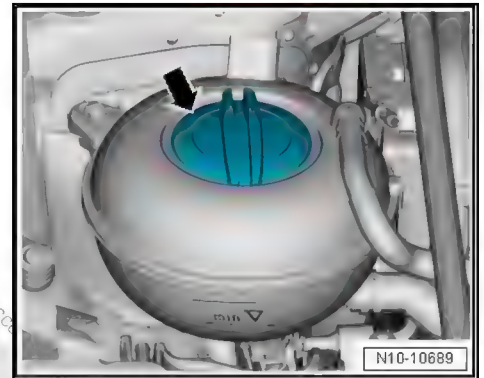
### Tightening Specifications

- ◆ Refer to ➔ [-2.1 Coolant Pump/Coolant Thermostat](#), page 285

## 2.8 Engine Coolant Temperature Sensor - G62-, Removing and Installing

### Removing

- The engine is cold.
- Briefly open the coolant expansion tank cap -arrow- and release any residual pressure in the cooling system and then close it again until it locks.



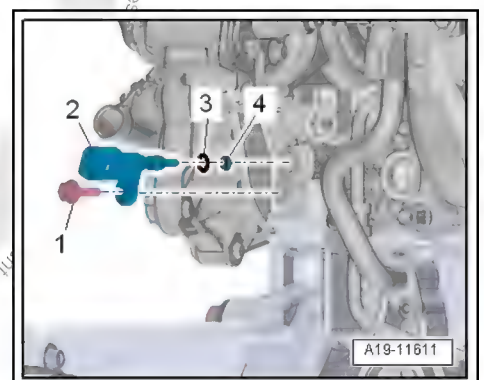
- Disconnect the connector.



### Note

*Place a cloth underneath to catch any escaping coolant.*

- Remove the bolt -1- and remove the Engine Coolant Temperature Sensor -G62- -2-.





#### Note

- ♦ Use a wire to remove the seal -3- and support ring -4- if they are stuck in the cylinder head.
- ♦ To prevent coolant loss, immediately insert the new Engine Coolant Temperature Sensor -G62- in the cylinder head.

#### Installing

Install in the reverse order of removal while noting the following:



#### Note

Replace the seal.

- Check the coolant level. Refer to ➤ [page 283](#) .

#### Tightening Specifications

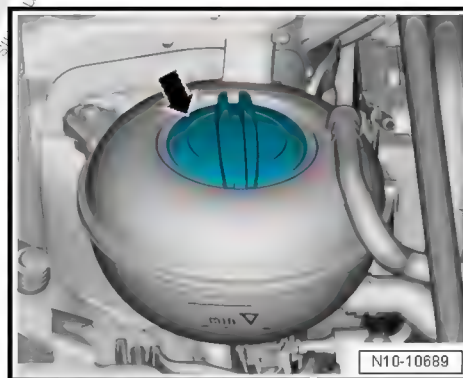
- ♦ Refer to ➤ [-2.3 Engine/Motor Coolant Temperature Sensor](#)”, [page 291](#)

## 2.9 Engine Coolant Temperature Sensor on Radiator Outlet -G83-, Removing and Installing

#### Removing

The engine is cold.

Briefly open the coolant expansion tank cap -arrow- and release any residual pressure in the cooling system and then close it again until it locks.



- Remove the noise insulation. Refer to ➤ Body Exterior; Rep. Gr. 66; Noise Insulation; Noise Insulation, Removing and Installing.
- Disconnect the connector -2-.





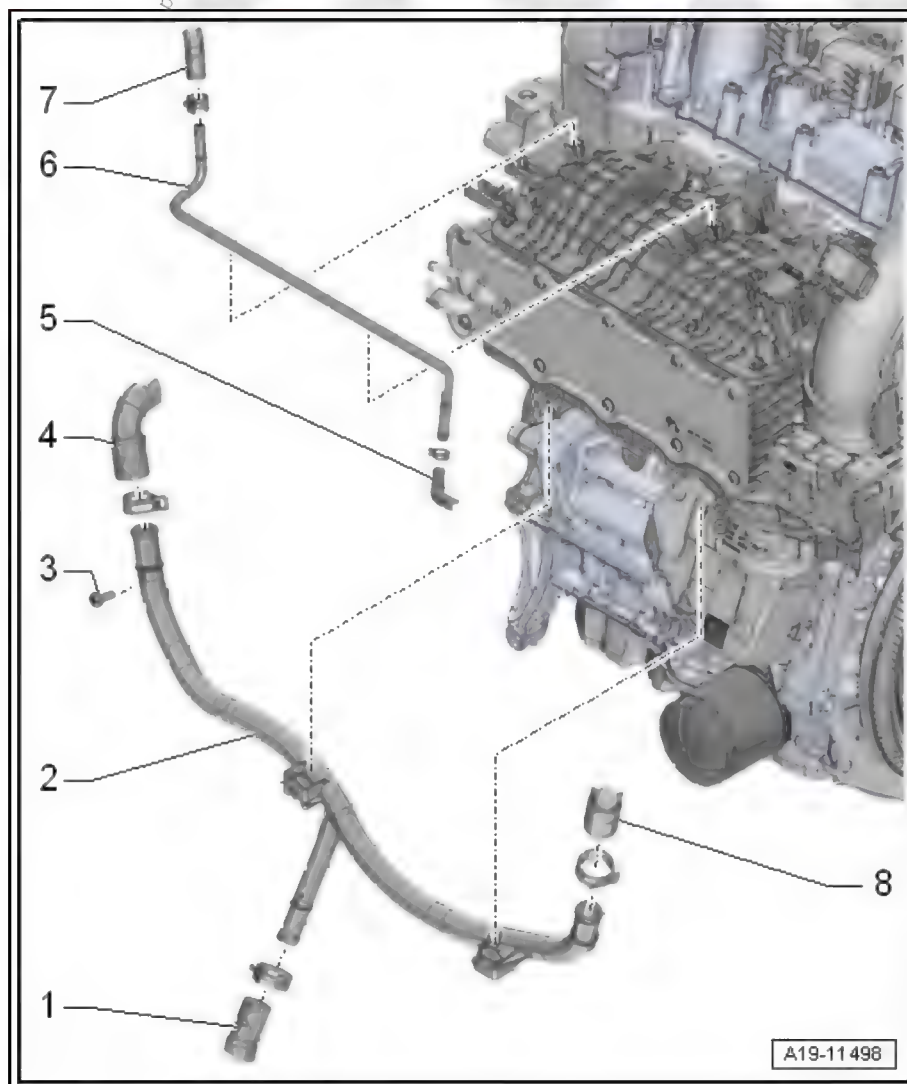
### 3 Coolant Pipes

⇒ -3.1 Coolant Pipes", page 316

⇒ P3.2 ipes, Removing and Installing", page 316

#### 3.1 Overview - Coolant Pipes

- 1 - Coolant Hose
- 2 - Coolant Pipe
  - ❑ Clipped to the bottom of the intake manifold
  - ❑ To remove the coolant pipe, use a screwdriver and carefully pry it out of its retainer.
- 3 - Bolt
  - ❑ 8 Nm
- 4 - Coolant Hose
- 5 - Coolant Hose
- 6 - Coolant Line
  - ❑ Clipped to the top of the intake manifold
- 7 - Coolant Hose
- 8 - Coolant Hose



#### 3.2 Coolant Pipes, Removing and Installing

Special tools and workshop equipment required





## 4 Radiator/Radiator Fan

⇒ [4.1 Radiator/Radiator Fan", page 319](#)

⇒ [R4.2 emoving and Installing", page 321](#)

⇒ [S4.3 hroud, Removing and Installing", page 324](#)

⇒ [F4.4 an, Removing and Installing", page 325](#)

### 4.1 Overview - Radiator/Radiator Fan



#### 14 - Rubber Bushing

- ☐ Radiator at the bottom in the lock carrier

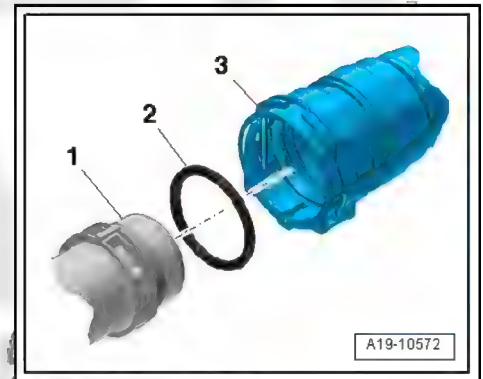
#### 15 - Bolt

- ☐ 5 Nm
- ☐ Radiator mounting to lock carrier

#### 16 - Radiator Mount

- ☐ For the radiator

### Connect the Coolant Hose to the Connector Coupling

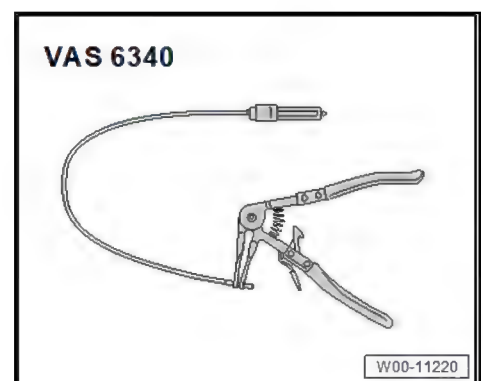


- Remove the old seal -2- in the coolant hose -3-.
- Coat the new seal with coolant and insert it in the coolant hose.
- Press the coolant hose onto the connection -1- until it engages audibly.
- Press the coolant hose on again and pull to make sure the connector coupling is engaged correctly.

## 4.2 Radiator, Removing and Installing

### Special tools and workshop equipment required

- ◆ Hose Clip Pliers -VAS 6340-





## Tightening Specifications

- ◆ Refer to ➤ [-4.1 Radiator/Radiator Fan-, page 319](#)

### 4.3 Fan Shroud, Removing and Installing

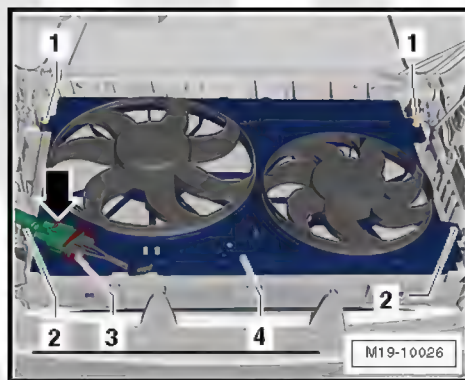
#### Removing

#### ⚠ CAUTION

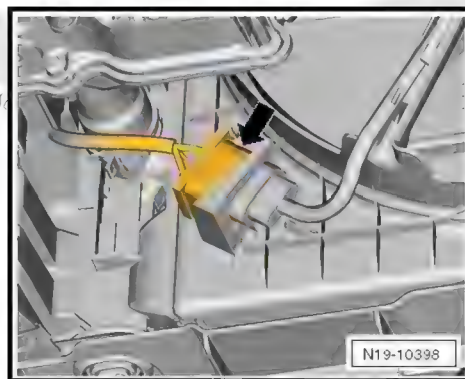
There is a risk of hand injury if the radiator fan turns on by itself.

- Do not reach into the radiator fan when disconnecting the connector.

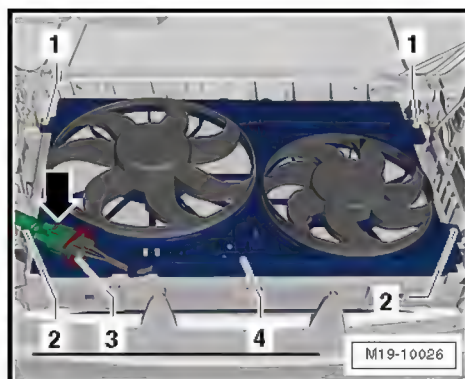
- Remove the bolts at the top of the fan shroud -1-



- Remove the noise insulation. Refer to ➤ [Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation](#).
- Release and disconnect the connector -arrow-



- Remove the bolts at the bottom of the fan shroud -2-



- Remove the fan shroud downward.

## Installing

Install in reverse order of removal. Note the following:

## Tightening Specifications

- ◆ Refer to ➔ [4.1 Radiator/Radiator Fan", page 319](#)
- ◆ Overview - Noise Insulation. Refer to ➔ Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation.

## 4.4 Radiator Fan, Removing and Installing

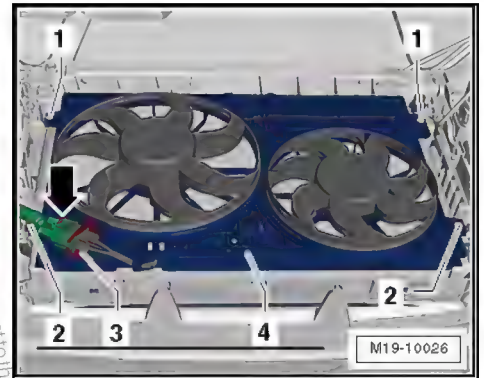
### Removing

#### ⚠ CAUTION

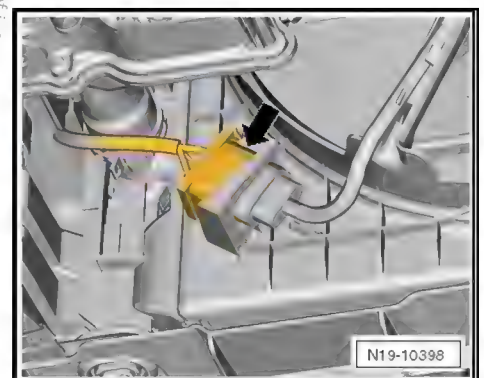
There is a risk of hand injury if the radiator fan turns on by itself.

- Do not reach into the radiator fan when disconnecting the connector.

- Remove the bolts from the fan shroud -1-.



- Remove the noise insulation. Refer to ➔ Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation.
- Release and disconnect the connector -arrow-.



- Remove the bolts for the fan shroud -2-.



## 21 – Turbocharger, Supercharger

### 1 Turbocharger

⇒ [-1.1 Turbocharger", page 327](#)

⇒ [R1.2 emoving and Installing", page 331](#)

⇒ [C1.3 harge Air Pressure ActuatorV465, Removing and Installing", page 338](#)

⇒ [C1.4 onnections, Removing and Installing", page 341](#)

#### 1.1 Overview - Turbocharger

⇒ [-1.1.1 Turbocharger, Version 1", page 327](#)

⇒ [-1.1.2 Turbocharger, Version 2", page 328](#)

⇒ [-1.1.3 Lines on Turbocharger", page 329](#)

##### 1.1.1 Overview - Turbocharger, Version 1





**1 - Turbocharger**

- ☐ Removing and Installing. Refer to ➤ [R1.2 removing and Installing", page 331](#) .

**2 - Bolt**

- ☐ 8 Nm

**3 - Connection**

**4 - Seal**

- ☐ Replace after removing
- ☐ Coat with clean engine oil before assembly

**5 - Seal**

- ☐ Replace after removing

**6 - Heat Shield**

**7 - Bolt**

- ☐ 25 Nm

**8 - Bolt or Nut**

- ☐ 8 Nm

**9 - Nut**

- ☐ 14 Nm
- ☐ Replace after removing

**10 - Bolt**

- ☐ 9 Nm
- ☐ Replace after removing

**11 - Clip**

- ☐ Replace after removing

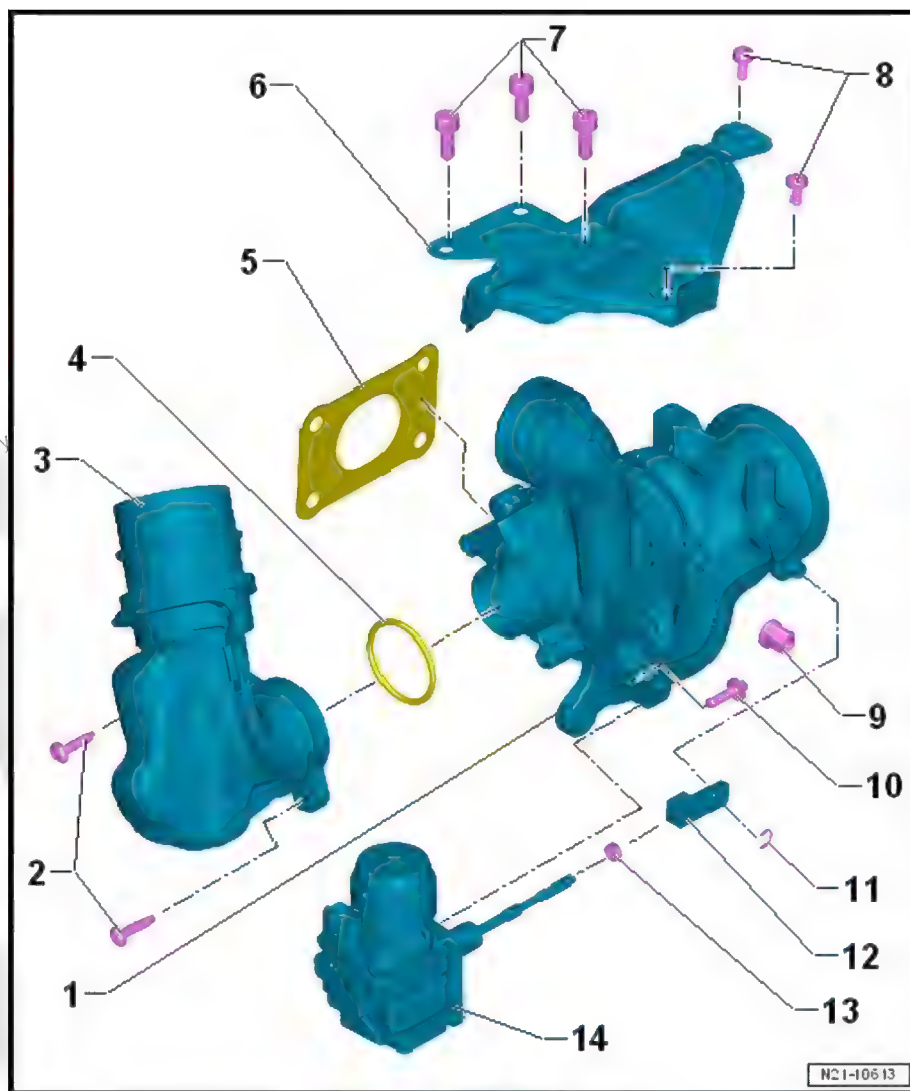
**12 - Operating Lever**

**13 - Lock Nut**

- ☐ 10 Nm
- ☐ Secure with sealing wax

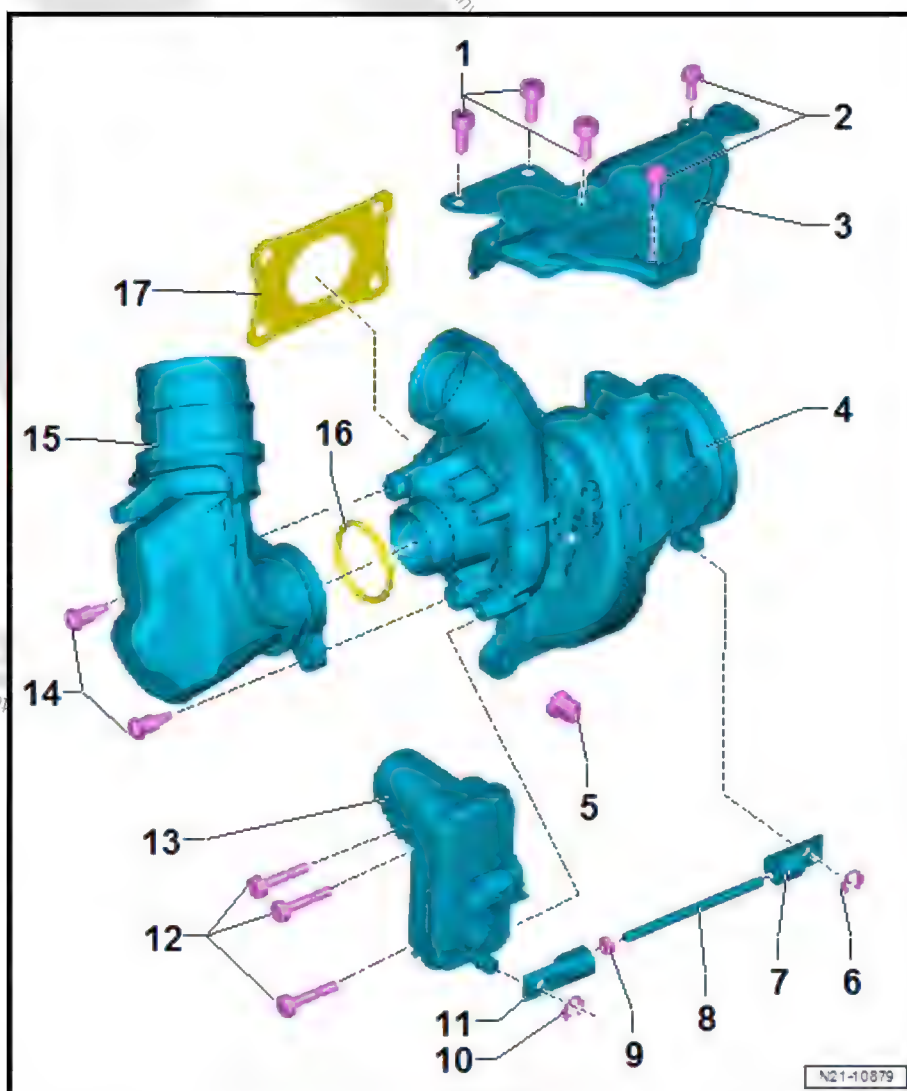
**14 - Charge Air Pressure Actuator -V465-**

- ☐ Different versions of the charge air pressure actuator may be installed.
- ☐ Removing and Installing. Refer to ➤ [C1.3 Charge Air Pressure Actuator V465, Removing and Installing", page 338](#) .



## 1.1.2 Overview - Turbocharger, Version 2

- 1 - Bolt
  - ☐ 25 Nm
- 2 - Bolt or Nut
  - ☐ 8 Nm
- 3 - Heat Shield
- 4 - Turbocharger
  - ☐ Removing and Installing. Refer to [C1.2 Removing and Installing](#), page 331.
- 5 - Nut
  - ☐ 14 Nm
  - ☐ Replace after removing
- 6 - Clip
  - ☐ Replace after removing
- 7 - Operating Lever
- 8 - Control Rod
- 9 - Lock Nut
  - ☐ 6 Nm
  - ☐ Secure with sealing wax
- 10 - Clip
  - ☐ Replace after removing
- 11 - Operating Lever
- 12 - Bolt
  - ☐ 8 Nm +45°
  - ☐ Replace after removing
- 13 - Charge Air Pressure Actuator -V465-
  - ☐ Different versions of the charge air pressure actuator may be installed.
  - ☐ Removing and Installing. Refer to [C1.3 Charge Air Pressure Actuator V465, Removing and Installing](#), page 338.
- 14 - Bolt
  - ☐ 8 Nm
- 15 - Connection
- 16 - Seal
  - ☐ Replace after removing
- 17 - Seal
  - ☐ Replace after removing

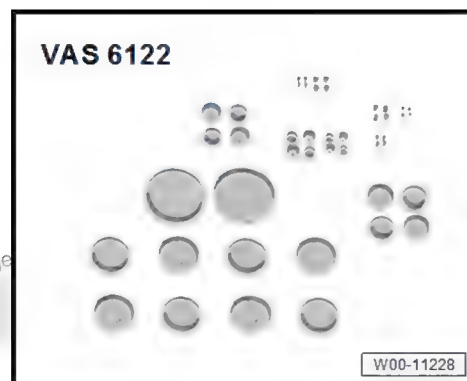


### 1.1.3 Overview - Lines on Turbocharger

## 1.2 Turbocharger, Removing and Installing

### Special tools and workshop equipment required

- ◆ Engine Bung Set -VAS 6122-



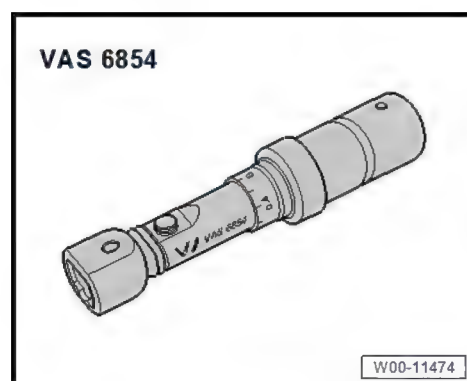
- ◆ Hose Clip Pliers -VAS 6362-



- ◆ Socket T30 -T10405-



- ◆ Mini Torque Wrench -VAS 6854-





## Tightening Specifications

- ◆ Refer to ➤ [-1.1 Turbocharger", page 327](#)
- ◆ Refer to ➤ [-2.1 Charge Air System", page 345](#)
- ◆ Refer to ➤ [-2.1 Air Filter Housing", page 368](#)
- ◆ Refer to ➤ [Fig. ""Air Ducts with Screw-Type Clamps, Installing", page 347](#)
- ◆ Refer to ➤ [Fig. ""Installing the Catalytic Converter - Tightening Specification and Sequence", page 419](#)
- ◆ Overview - Drive Axle. Refer to ➤ Suspension, Wheels, Steering; Rep. Gr. 40; Drive Axle; Overview - Drive Axle.

## 1.3 Charge Air Pressure Actuator -V465-, Removing and Installing

➤ [C1.3.1 Charge Air Pressure Actuator V465, Removing and Installing, Version 1", page 338](#)

➤ [C1.3.2 Charge Air Pressure Actuator V465, Removing and Installing, Version 2", page 340](#)

### 1.3.1 Charge Air Pressure Actuator -V465-, Removing and Installing, Version 1



#### Note

- ◆ *Different versions of the charge air pressure actuator are installed.*
- ◆ *The mounting points of the charge air pressure actuators are different.*
- ◆ *Before installing check with a visual inspection which version applies to the repair.*

## Special tools and workshop equipment required

- ◆ Chain Tensioner Locking Tool -T40265-





### 1.3.2 Charge Air Pressure Actuator -V465-, Removing and Installing, Version 2



#### Note

- ◆ Different versions of the charge air pressure actuator are installed.
- ◆ The mounting points of the charge air pressure actuators are different.
- ◆ Before installing check with a visual inspection which version applies to the repair.

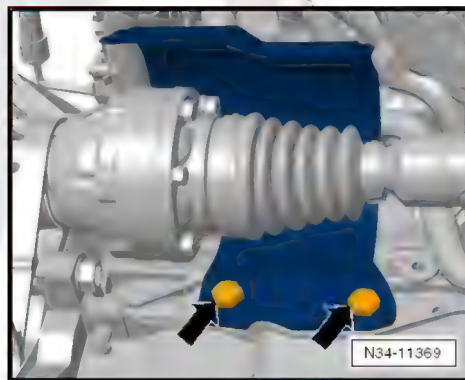
#### Special tools and workshop equipment required

- ◆ Chain Tensioner Locking Tool -T40265-



#### Removing

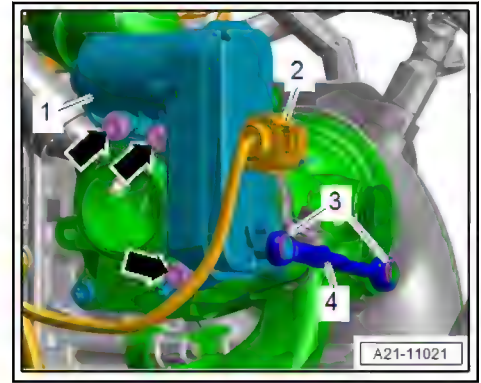
- Remove the noise insulation. Refer to ⇒ Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation.
- Remove the air duct pipe. Refer to ⇒ [D2.5 Air Duct Pipe, Removing and Installing](#), page 355 .
- Remove the resonator for the intake air scoop. Refer to ⇒ [A2.3 Intake Air Scoop Resonator, Removing and Installing](#), page 371 .
- Remove the turbocharger connection. Refer to ⇒ [C1.4 Turbocharger Connections, Removing and Installing](#), page 341 .
- Remove the bolts -arrows-.



- Remove the right drive axle heat shield.
- Remove the lock washer -3- using the Chain Tensioner Locking Tool -T40265- and remove the release lever -4-.







- Remove the bolts -arrows-.
- Disconnect the connector -2- and remove the Charge Air Pressure Actuator -V465- -1-.
- Mark or measure the control rod installation position.

### Installing

Install in the reverse order of removal while noting the following:

- Replace the bolts and clips.
- Replace the seals after removing.
- Coat the seals lightly with clean engine oil before installing.
- Install the control rod according to the previously made marking.

### Charge Air Pressure Actuator without Adjustable Linkage

- Adapt the Engine Control Module -J623- to the Charge Air Pressure Actuator -V465- using the ⇒ Vehicle diagnostic tester by selecting 01 - Charge Air Pressure Actuator V465, Adjusting in Guided Functions.

### Charge Air Pressure Actuator with Adjustable Linkage

- Install the thread of the Charge Air Pressure Actuator -V465- into the joint in the center position.
- Adjust the Charge Air Pressure Actuator -V465- using the ⇒ Vehicle diagnostic tester by selecting 01 - Charge Air Pressure Actuator V465, Adjusting in Guided Functions.
- Turn the linkage to adjust the specified value. For the specified value, use the ⇒ Vehicle diagnostic tester.
- Tighten the lock nut to 6 Nm and secure with sealing wax.

### Tightening Specifications

- ◆ Refer to ⇒ -1.1 Turbocharger", page 327
- ◆ Refer to ⇒ -2.1 Charge Air System", page 345
- ◆ Overview - Noise Insulation. Refer to ⇒ Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation.
- ◆ Overview - Drive Axle. Refer to ⇒ Suspension, Wheels, Steering; Rep. Gr. 40; Drive Axle; Overview - Drive Axle.

## 1.4 Turbocharger Connections, Removing and Installing

Special tools and workshop equipment required



## 2 Charge Air System

⇒ [2.1 Charge Air System", page 345](#)

⇒ [A2.2 Air Cooler, Removing and Installing", page 348](#)

⇒ [C2.3 Charge Air Pressure Sensor GX26, Removing and Installing", page 352](#)

⇒ [A2.4 Air System, Checking for Leaks", page 352](#)

⇒ [D2.5 Duct Pipe, Removing and Installing", page 355](#)

### 2.1 Overview - Charge Air System



#### Note

*Before checking or repairing, check if all air duct pipes and hoses as well as vacuum lines are connected properly and are not leaking.*



- ☐ Removing and Installing. Refer to ⇒ [T3.3 Throttle Valve Control Module GX3, Removing and Installing](#), page 379 .

#### 11 - Seal

- ☐ Replace after removing

#### 12 - Intake Manifold

Removing and Installing. Refer to ⇒ [M3.2 Intake Manifold, Removing and Installing](#), page 376 .

#### 13 - Seal

- ☐ Replace after removing

#### 14 - Sealing Lip

- ☐ Replace after removing
- ☐ When installing, coat the seal with clean engine oil

#### 15 - Coolant Hose

#### 16 - Clamp

#### 17 - Charge Air Cooler

- ☐ Removing and Installing. Refer to ⇒ [A2.2 Air Cooler, Removing and Installing](#), page 348 .
- ☐ Fill the coolant after replacing. Refer to ⇒ [page 279](#) .

#### 18 - Bolt

- ☐ 15 Nm
- ☐ Thread cutting
- ☐ Position the bolt by hand and tighten it until it finds the old threads. Then tighten the bolt to the tightening specification

#### 19 - Coolant Hose

#### 20 - Clamp

#### 21 - Coolant Hose

#### 22 - Clamp

#### 23 - Bolt

- ☐ Tightening specification and sequence. Refer to ⇒ [3.1 Intake Manifold](#), page 373 .

#### 24 - Seal

- ☐ Replace after removing

#### 25 - Intake Manifold Sensor-GX9-

- ☐ Consists of
  - Intake Air Temperature Sensor 2 -G299-
  - Manifold Absolute Pressure Sensor -G71-

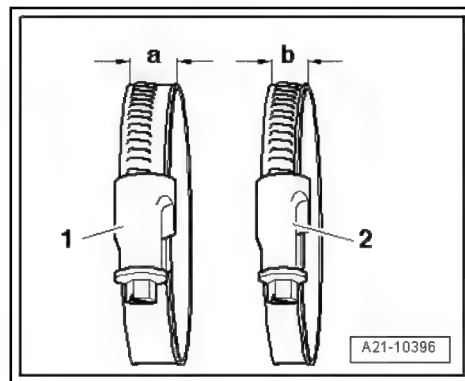
- ☐ Removing and Installing. Refer to ⇒ [I4.3 Intake Manifold Sensor GX9, Removing and Installing](#), page 389 .

#### 26 - Seal

- ☐ Replace after removing
- ☐ Quantity: 4

#### Air Ducts with Screw-Type Clamps, Installing





#### Note

- ◆ The hose connections as well as air duct pipes and hoses must be free of oil and grease before installing.
- ◆ Secure all hose connections with standard production hose clamps. Refer to the ➔ Electronic Parts Catalog (ETKA).
- ◆ In order to be able to securely mount the air guide hoses on their connectors, the bolts on the used clamps must be sprayed with a rust remover before installing.

#### Tightening Specifications

Component	Width	Tightening Specification
Hose clamp -1-	-a- = 13 mm wide	5.5 Nm
Hose clamp -2-	-b- = 9 mm wide	3 Nm

## 2.2 Charge Air Cooler, Removing and Installing

#### Special tools and workshop equipment required

- ◆ Hose Clamps - Up To 25 mm -3094-





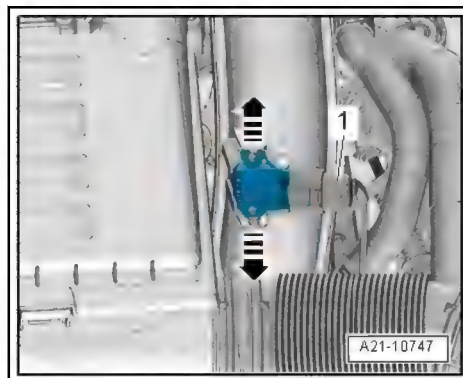
- ♦ A/C Compressor. Refer to ➔ Heating, Ventilation and Air Conditioning; Rep. Gr. 87; A/C Compressor.

## 2.3 Charge Air Pressure Sensor -GX26-, Removing and Installing

Charge Air Pressure Sensor -GX26- consists of:

- ♦ Charge Air Pressure Sensor -G31-
- ♦ Intake Air Temperature Sensor -G42-

### Removing



- Release and disconnect the connector -1-.
- Release the catches in direction of -arrows- and remove the Charge Air Pressure Sensor -GX26-.

### Installing

Install in the reverse order of removal while noting the following:

- Check the seal for damage and replace if necessary.



### Note

*If the tabs break while being removed, the sensor can alternatively be mounted with two bolts. Refer to the ➔ Electronic Parts Catalog (ETKA).*

### Tightening Specifications

Component	Tightening Specification
Charge Air Pressure Sensor - GX26-	3 Nm

## 2.4 Charge Air System, Checking for Leaks

Special tools and workshop equipment required





### Tightening Specifications

- ◆ Refer to ➔ [-1.1 Turbocharger](#), page 327
- ◆ Refer to ➔ [-2.1 Air Filter Housing](#), page 368
- ◆ Refer to ➔ [Fig. "Air Ducts with Screw-Type Clamps, Installing", page 347](#)

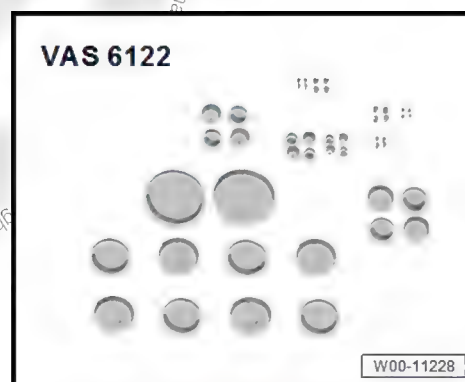
## 2.5 Air Duct Pipe, Removing and Installing

### Special tools and workshop equipment required

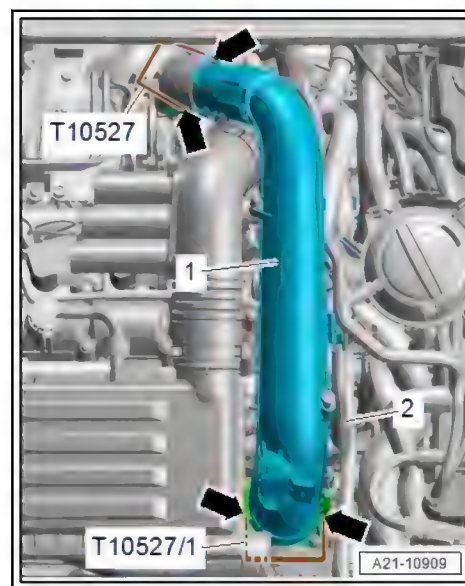
- ◆ Intake Manifold Release Tool -T10527-



- ◆ Engine Bung Set -VAS 6122-



### Removing



- Remove the air filter housing. Refer to ➔ [F2.2 Filter Housing, Removing and Installing](#), page 370.



## 24 – Multiport Fuel Injection

### 1 Fuel Injectors

⇒ [1.1 Fuel Rail with Fuel Injectors", page 357](#)

⇒ [1.2 Fuel Rail, Removing and Installing", page 359](#)

⇒ [1.3 Fuel Injectors, Removing and Installing", page 360](#)

⇒ [1.4 Fuel Injectors, Cleaning", page 366](#)

#### 1.1 Overview - Fuel Rail with Fuel Injectors



## 1.2 Fuel Rail, Removing and Installing

### Removing

#### CAUTION

The fuel system is under pressure.

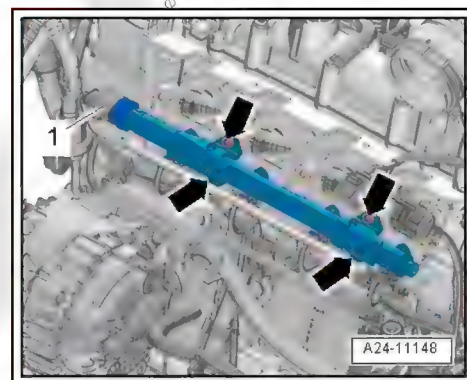
Risk of injury from fuel spraying out.

- Wear protective eyewear.
- Wear safety gloves.
- Reduce the pressure: place clean cloths around the connection point and carefully open the connection point.

#### WARNING

- ◆ You must remove the fuse for the fuel pump control module before starting any repairs of the vehicle's fuel system. Failing to do so could result in fire and personal injuries.
- ◆ Do not turn on the ignition, open the front doors, or attempt to start the engine at any time while any part of the vehicle's fuel system is unassembled. Failing to heed this warning could result in fire and personal injury

- Remove the intake manifold. Refer to ⇒ [M3.2 anifold, Removing and Installing](#), page 376 .
- Remove the high pressure pipe. Refer to ⇒ [P6.3 ressure Pipe, Removing and Installing](#), page 398 .
- Disconnect the connector -1-.



#### Note

Place a cloth underneath to catch any escaping fuel.



- Remove the bolts -arrows- and pull the fuel rail off the fuel injectors.

### Installing

Install in the reverse order of removal while noting the following:

- Replace the seal.
- Place the fuel rail mounts on the fuel injectors.
- Press the fuel rail all the way onto the fuel injectors, first on the right side and then on the left.



- Press the fuel rail firmly near the bracket and install the bolts 2 threads.
- Tighten the bolts evenly diagonally.
- Install the high pressure pipe. Refer to ⇒ [P6.3 Pressure Pipe, Removing and Installing](#), page 398 .
- Install the intake manifold. Refer to ⇒ [M3.2 Intake Manifold, Removing and Installing](#), page 376 .

#### Tightening Specifications

- ◆ Refer to ⇒ [-1.1 Fuel Rail with Fuel Injectors](#), page 357

### 1.3 Fuel Injectors, Removing and Installing

#### Special tools and workshop equipment required

- ◆ Injector/Combustion Chamber Seal Tool Set -T10133C- with Removal Tool -T10133/16 A- and Puller -T10133/19-



#### WARNING

- ◆ You must remove the fuse for the fuel pump control module before starting any repairs of the vehicle's fuel system. Failing to do so could result in fire and personal injuries.
- ◆ Do not turn on the ignition, open the front doors, or attempt to start the engine at any time while any part of the vehicle's fuel system is unassembled. Failing to heed this warning could result in fire and personal injury

#### Removing



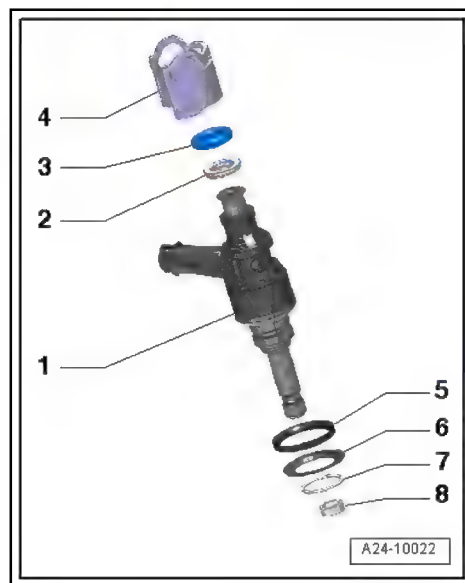
#### Note

*The fuel injectors can only be removed when the engine is cold.*

- Remove the intake manifold. Refer to ⇒ [M3.2 Intake Manifold, Removing and Installing](#), page 376 .
- Remove the fuel rail. Refer to ⇒ [R1.2 Fuel Rail, Removing and Installing](#), page 359



- Coat the new seal -3- with clean engine oil before installing the fuel injector -1-.



#### Note

*The combustion chamber seal -8- must not be oiled.*

- Install the fuel injectors all the way into the openings in the cylinder head (free of oil and grease) by hand. Make sure the fuel injectors are positioned correctly inside the cylinder head.



#### Note

- ♦ *The fuel injectors must not be difficult to install. If necessary, wait as the combustion chamber seal continues to pull itself together.*
- ♦ *Make sure that the fuel injectors are installed securely in the cylinder head.*
- The electrical connection of the fuel injector must engage in the intended opening in the cylinder head.
- Install the fuel rail. Refer to [⇒ R1.2 rail, Removing and Installing](#), page 359.
- Install the intake manifold. Refer to [⇒ M3.2 manifold, Removing and Installing](#), page 376.

## 1.4 Fuel Injectors, Cleaning

### Special tools and workshop equipment required

- ♦ Ultrasonic Cleaning Unit -VAS 6418-
- ♦ Mounting Plate for Injection Modules -VAS 6418/1-
- ♦ Cleaning Fluid. Refer to the ⇒ Electronic Parts Catalog (ET-KA).







## 2 Air Filter

⇒ [2.1 Air Filter Housing", page 368](#)

⇒ [F2.2 ilter Housing, Removing and Installing", page 370](#)

⇒ [A2.3 ir Scoop Resonator, Removing and Installing", page 371](#)

### 2.1 Overview - Air Filter Housing



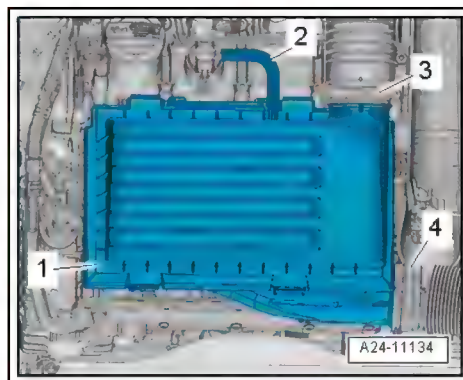


❑ Part may appear different than shown in the illustration.

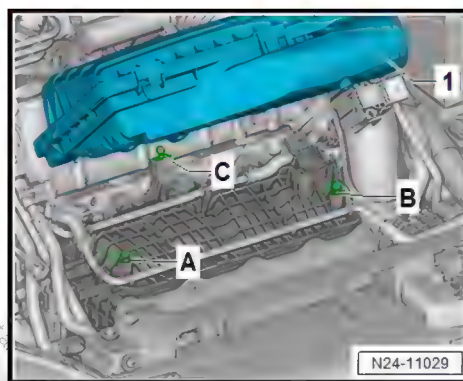
## 2.2 Air Filter Housing, Removing and Installing

### Removing

Remove the engine cover. Refer to ➔ [C3.1 over, Removing and Installing](#), page 106 .



- Remove the air duct hose -2-.
- Loosen the clamps -3 and 4- and remove the air guides.
- Pull the air filter housing -1- in the following sequence upward off of the ball pins.



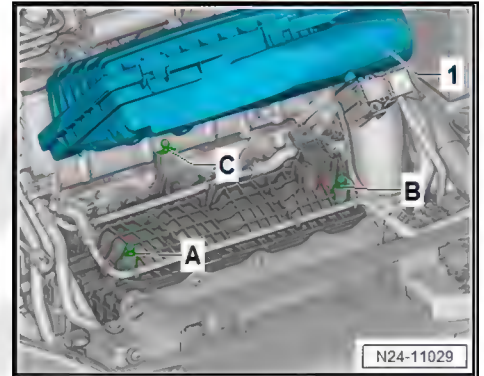
- Next remove the air filter housing from the ball pin -C-.
- Then remove the air filter housing from the ball pins -B and A-.

## Installing



### Note

- ◆ *In the event the air filter element is very dirty or soaked, dirt particles or moisture may have contaminated the component and may be causing false measured values. This results in reduced performance, since a lower injection quantity is calculated.*
- ◆ *Always use an original air filter element.*
- ◆ *The air filter housing must always be clean.*
- ◆ *The hose connections as well as air duct pipes and hoses must be free of oil and grease before installing.*
- ◆ *Use a silicone-free lubricant to mount the air guide hoses.*
- ◆ *Secure all hose connections with standard production hose clamps. Refer to the ⇒ [Electronic Parts Catalog \(ETKA\)](#).*
- ◆ *Cover the critical air directing components such as air duct pipes, etc. with a clean cloth before blowing out the air filter housing with compressed air.*
- ◆ *Pay attention to the disposal regulations!*
- Remove any salt residue, dirt or leaves from the air filter housing upper and lower sections.
- Clean the water drain with compressed air.
- Adhere to the assembly sequence.



- Push the air filter housing -1- on the ball pins -A and B-.
- Then push the air filter housing on the ball pin -C-.
- Install the engine cover. Refer to ⇒ [C3.1 over, Removing and Installing](#), page 106 .

## Tightening Specifications

- ◆ Refer to ⇒ [-2.1 Air Filter Housing](#), page 368

## 2.3 Intake Air Scoop Resonator, Removing and Installing

### Removing

- Loosen the clamps -1 and 2-.



### 3 Intake Manifold

⇒ [-3.1 Intake Manifold", page 373](#)

⇒ [M3.2 anifold, Removing and Installing", page 376](#)

⇒ [T3.3 hrottle Valve Control ModuleGX3, Removing and Installing", page 379](#)

⇒ [T3.4 hrottle Valve Control ModuleGX3, Cleaning", page 381](#)

#### 3.1 Overview - Intake Manifold





## 3.2 Intake Manifold, Removing and Installing

### Removing

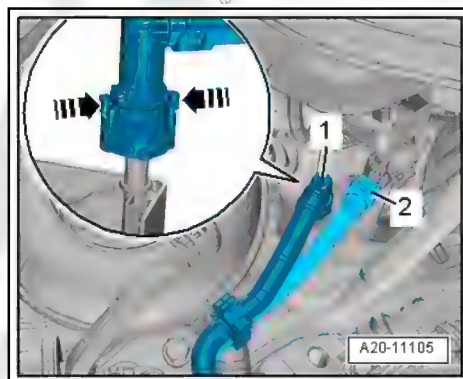
- Remove the air filter housing. Refer to ➤ [F2.2 Filter Housing, Removing and Installing](#), page 370 .
- Remove the noise insulation. Refer to ➤ Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation.
- Place the Shop Crane - Drip Tray -VAS 6208- underneath.
- Drain the coolant. Refer to ➤ [D1.3 Draining and Filling](#), page 275 .

### ⚠ CAUTION

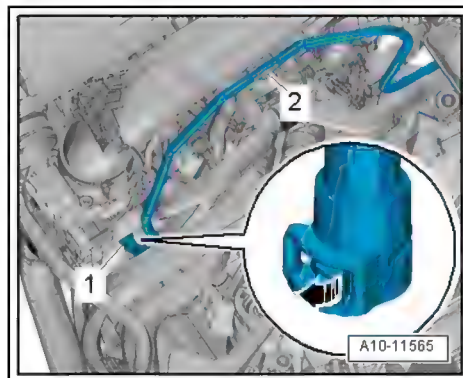
The fuel system is under pressure.

Risk of injury from fuel spraying out.

- Wear protective eyewear.
  - Wear safety gloves.
  - Reduce the pressure: place clean cloths around the connection point and carefully open the connection point.
- 
- First push the hose coupling -1- downward and then press the release buttons -arrows-.

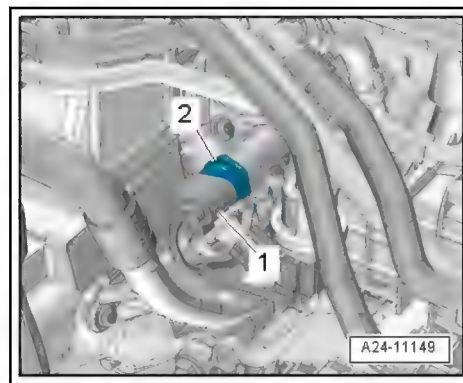


- Remove the hose coupling with the release buttons pressed.
- Press the release button on the EVAP canister hose -2-.
- Remove the hose and free it up.
- Open the retainer in direction of -arrow- and remove the vacuum hose -1-.

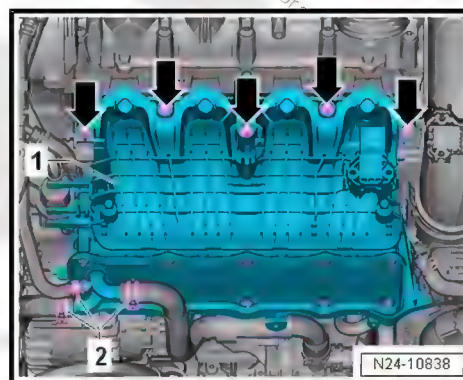


- Free up the vacuum hose on the air duct pipe -2-.





- Disconnect the connector from the oil pressure switch.
- Loosen the clamps -2- and remove the coolant hoses.
- Remove the bolts -arrows-.



- Remove the intake manifold -1-.

#### Installing

Install in the reverse order of removal while noting the following:



#### Note

*Replace the gaskets and seals.*

- Install the noise insulation. Refer to ➤ [Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation](#).
- Install the air filter housing. Refer to ➤ [F2.2 Filter Housing, Removing and Installing", page 370](#).
- Fill the coolant. Refer to ➤ [D1.3 draining and Filling", page 275](#).

#### Tightening Specifications

- ◆ Refer to ➤ [-3.1 Intake Manifold", page 373](#)

### 3.3 Throttle Valve Control Module -GX3-, Removing and Installing

The Throttle Valve Control Module -GX3- is comprised of:

- ◆ Throttle Valve Control Module -J338-
- ◆ EPC Throttle Drive -G186-
- ◆ EPC Throttle Drive Angle Sensor 1 -G187-
- ◆ EPC Throttle Drive Angle Sensor 2 -G188-

### 3.4 Throttle Valve Control Module -GX3-, Cleaning



#### Note

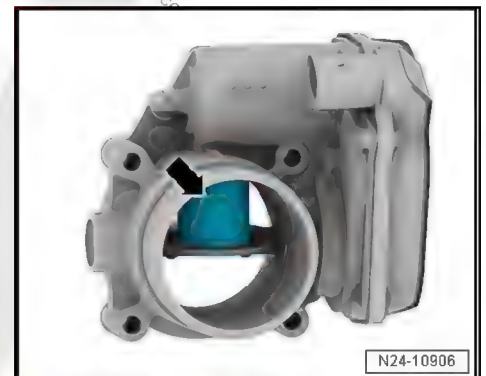
- ◆ If a new Engine Control Module -J623- is installed, then it must be adapted to the throttle valve control module.
- ◆ Dirt and coking on the end stop can produce incorrect adaptation values.
- ◆ The throttle valve connections must not be scratched when cleaning.

#### Special tools and workshop equipment required

- ◆ Acetone, commercially available
- ◆ Brush

#### Procedure

- Remove the Throttle Valve Control Module -GX3-. Refer to [T3.3 Throttle Valve Control Module GX3, Removing and Installing](#), page 379.
- Open the throttle valve by hand and lock it in this position using a plastic or wood wedge -arrow-.



#### CAUTION

Risk of injury from acetone. Acetone is highly flammable and can cause eye and skin irritation.

- Wear protective eyewear.
- Wear safety gloves.

- Clean the throttle valve connection thoroughly with acetone and a brush especially in the area -arrows- near the closed throttle valve.



## 4 Sensors

⇒ [F4.1 uel Pressure SensorG247, Removing and Installing", page 383](#)

⇒ [F4.2 uel Pressure SensorG247, Checking", page 384](#)

⇒ [I4.3 ntake Manifold SensorGX9, Removing and Installing", page 389](#)

### 4.1 Fuel Pressure Sensor -G247-, Removing and Installing

Special tools and workshop equipment required

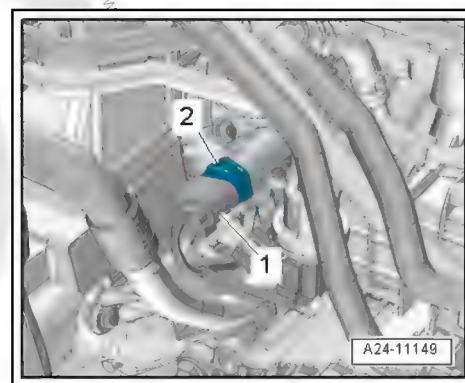
- ◆ Elbow Assembly Tool -T10118-



- ◆ Socket - 27mm -T40218- or a commercially available 27 mm socket



#### Removing



- Disconnect the connector -1-.



#### Note

*Place a cloth underneath to catch any escaping fuel.*

- Remove the Fuel Pressure Sensor -G247- -2- using the Socket - 27mm -T40218-.

#### Installing

Install in the reverse order of removal while noting the following:



#### Note

*Do not coat the thread on the fuel pressure sensor.*

#### Tightening Specifications

- ◆ Refer to ➤ [-1.1 Fuel Rail with Fuel Injectors”, page 357](#)

## 4.2 Fuel Pressure Sensor -G247-, Checking

➤ [F4.2.1 Fuel Pressure Sensor G247, Checking with Pressure Sensor Tester VAS 6394 and Vehicle Diagnostic Tester”, page 384](#)

➤ [F4.2.2 Fuel Pressure Sensor G247, Checking using Vehicle Diagnostic Tester”, page 387](#)

### 4.2.1 Fuel Pressure Sensor -G247-, Checking with Pressure Sensor Tester - VAS 6394- and Vehicle Diagnostic Tester

#### Special tools and workshop equipment required

- ◆ Vehicle Diagnostic Tester
- ◆ Vehicle Diagnostic Tester - Test Adapter - 3 Pin - VAS 5570-



- ◆ Pressure Sensor Tester -VAS 6394-
- ◆ Socket, 27 mm long, commercially available





- If the measured values do not match again, check the wire connection between the Fuel Pressure Sensor -G247- and the Engine Control Module -J623-. Refer to ➔ Wiring diagrams, Troubleshooting & Component locations.

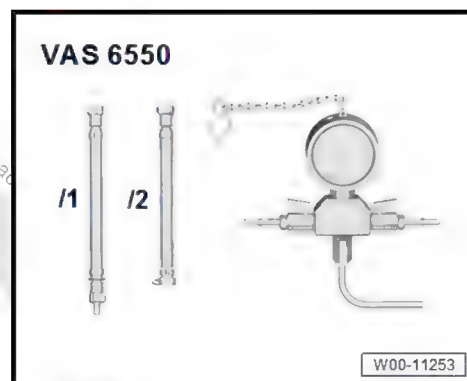
### Tightening Specifications

- ◆ Refer to ➔ [-1.1 Fuel Rail with Fuel Injectors-](#), page 357

## 4.2.2 Fuel Pressure Sensor -G247-, Checking using Vehicle Diagnostic Tester

### Special tools and workshop equipment required

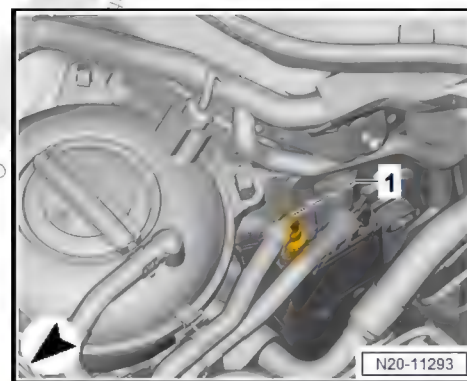
- ◆ Pressure Tester Kit -VAS 6550-



- ◆ ➔ Vehicle diagnostic tester

### Conditions:

- Fuel tank filled  $\frac{1}{4}$  of the way with fuel.
- Remove the supply line -1-. Disconnect the connector couplings. Refer to ➔ Fuel Supply System; Rep. Gr. 20; Connector Couplings; Connector Couplings, Disconnecting.



### ⚠ CAUTION

The fuel system is under pressure.  
Risk of injury from fuel spraying out.

- Wear protective eyewear.
- Wear safety gloves.
- Reduce the pressure: place clean cloths around the connection point and carefully open the connection point.

- Collect leaking fuel with a cleaning cloth.
- Connect the Pressure Tester Kit - Hose 1 -VAS 6550/1- to the connection -A- on the Pressure Tester Kit -VAS 6550-.



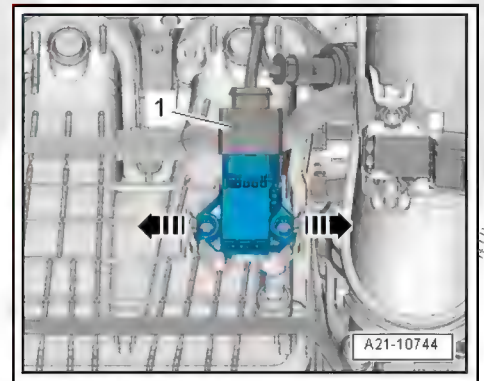
### 4.3 Intake Manifold Sensor -GX9-, Removing and Installing

Intake Manifold Sensor -GX9- consists of:

- ◆ Intake Air Temperature Sensor 2 -G299-
- ◆ Manifold Absolute Pressure Sensor -G74-

#### Removing

- Remove the air filter housing. Refer to ➔ [F2.2 ilter Housing, Removing and Installing", page 370](#).
- Disconnect the connector -1-.



- Release the retainers in direction of -arrows- and remove the Intake Manifold Sensor -GX9-.

#### Installing

Install in the reverse order of removal while noting the following:

- Replace the seal.



#### Note

*Screw down the Intake Manifold Sensor -GX9- if the retainers have broken off. Bolts. Refer to the ➔ [Electronic Parts Catalog \(ETKA\)](#).*

- Install the air filter housing. Refer to ➔ [F2.2 ilter Housing, Removing and Installing", page 370](#).

#### Tightening Specifications

Component	Tightening Specification
Intake Manifold Sensor -GX9-	3 Nm



## 5 Engine Control Module

⇒ E5.1 Engine Control Module J623, Removing and Installing",  
page 390

### 5.1 Engine Control Module -J623-, Removing and Installing

⇒ E5.1.1 Engine Control Module J623, Removing and Installing,  
without Protective Housing", page 390

⇒ E5.1.2 Engine Control Module J623 with Protective Housing,  
Removing and Installing", page 391

#### 5.1.1 Engine Control Module -J623-, Removing and Installing, without Protective Housing



#### Note

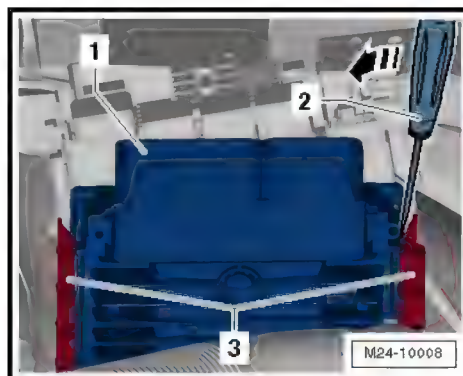
If the engine control module is being replaced, connect the  
⇒ Vehicle diagnostic tester and perform the "Replace control  
module" function.

#### Removing

- Switch off the ignition.
- Remove the E-box cover inside the engine compartment  
-arrows-.

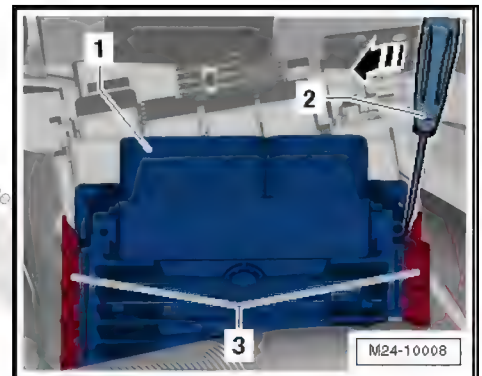


- Unlock and disconnect the connector from the engine control module.
- Push the tabs on the side guides -3- carefully toward the outside with a screwdriver -2-.



- Remove the engine control module -1- upward from the side guides -3-.

### Installing



- Install the engine control module -1- into the side guides -3- until it locks.
- Connect the connector to the engine control module and lock.
- Install the E-box cover -arrows-.



## 5.1.2 Engine Control Module -J623- with Protective Housing, Removing and Installing

### Special tools and workshop equipment required

- ◆ Cutting grinder, such as the Axial Grinder - Straight -VAS 6682-



### Note

- ◆ *If the engine control module is being replaced, connect the ⇒ Vehicle diagnostic tester and perform the "Replace control module" function.*
- ◆ *Shear bolts attach the protective housing. It is not possible to remove the shear bolts without damaging them. Use Axial Grinder - Straight -VAS 6682- or a cutting grinder to remove the shear bolts. The protective housing must be replaced if it was damaged.*

### Removing

- Switch off the ignition.



## 6 High Pressure Pump

⇒ [-6.1 High Pressure Pump", page 394](#)

⇒ [P6.2 ressure Pump, Removing and Installing", page 395](#)

⇒ [P6.3 ressure Pipe, Removing and Installing", page 398](#)

### 6.1 Overview - High Pressure Pump

#### 1 - Roller Tappet

- ☐ Coat with clean engine oil before assembly

#### 2 - Seal

- ☐ Replace after removing
- ☐ Coat with clean engine oil before assembly

#### 3 - High Pressure Pump

- ☐ With Fuel Pressure Regulator Valve -N276-
- ☐ Do not disassemble
- ☐ Removing and Installing. Refer to ⇒ [P6.2 ressure Pump, Removing and Installing", page 395](#) .

#### 4 - High Pressure Pipe

- ☐ 16 Nm +45°
- ☐ Does not have to be replaced after dismounting
- ☐ Connections should not show any signs of damage
- ☐ Do not change the bending shape.
- ☐ Removing and Installing. Refer to ⇒ [P6.3 ressure Pipe, Removing and Installing", page 398](#) .
- ☐ Coat the thread on the union nut with clean engine oil.

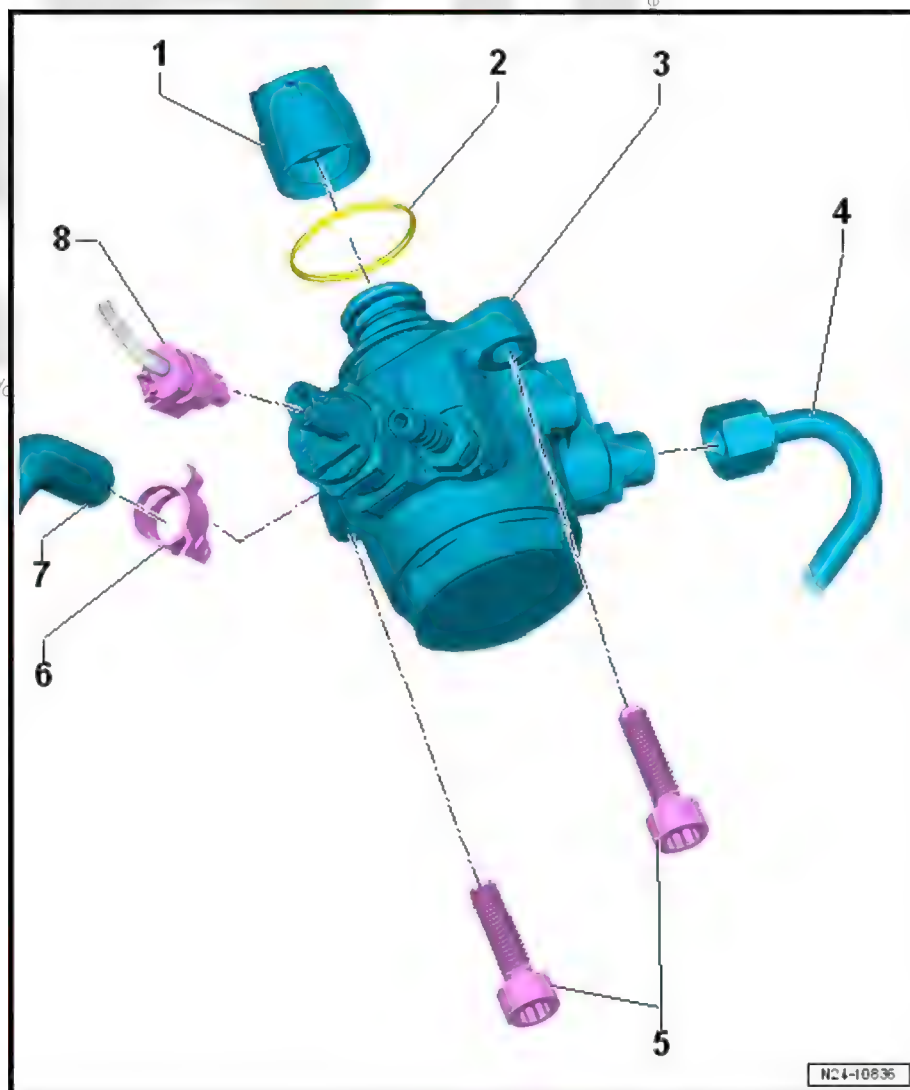
#### 5 - Bolt

- ☐ Replace after removing
- ☐ Tightening specification and sequence. Refer to ⇒ [Fig. ""High Pressure Pump - Tightening Specification and Sequence""", page 394](#) .

#### 6 - Hose Clamp

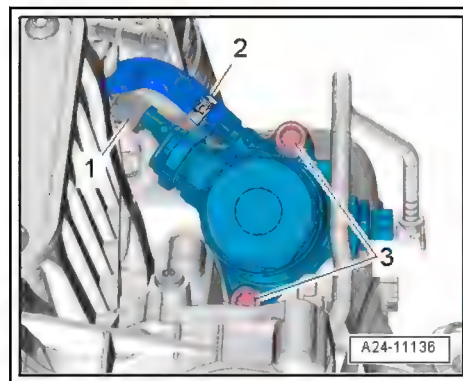
#### 7 - Fuel Supply Line

#### 8 - Connector



### High Pressure Pump - Tightening Specification and Sequence





Mount the high pressure pump as follows to prevent the flange from becoming deformed:

- Tighten the bolts in stages as follows:

Step	Component	Tightening Specification/Additional Turn
1	Bolt -3-	Install all the way by hand
2	Bolt -3-	Tighten 1 turn from side to side until the flange on the high pressure pump touches the camshaft housing
3	Bolt -3-	20 Nm
4	Bolt -3-	90° additional turn

## 6.2 High Pressure Pump, Removing and Installing

Special tools and workshop equipment required

- ◆ Torque Wrench 1410 -V.A.G 1410-

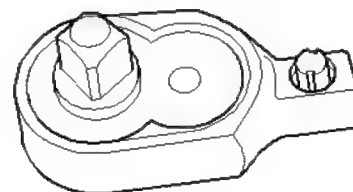
**V.A.G 1410**



W00-11174

- ◆ Torque Wrench 1410 Insert - Ratchet -V.A.G 1410/3-

**V.A.G 1410/3**

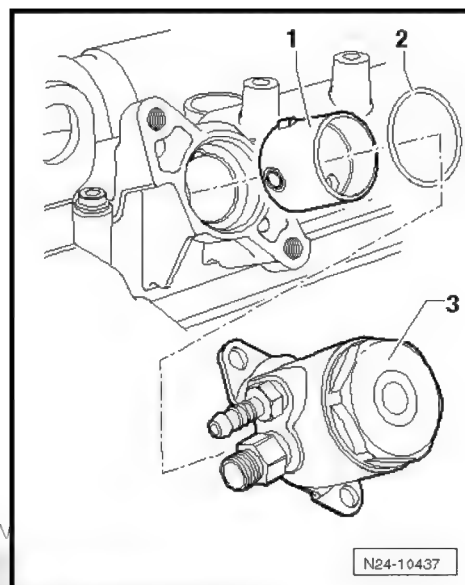


W00-1163





## Installing



- Check the roller tappet for damage. Replace if necessary.
- Coat the roller tappet -1- with clean engine oil.
- Install the roller tappet -1- into the camshaft housing.
- At the same time the tab on the plunger must sit in the guide of the high pressure pump.
- Turn the crankshaft in direction of engine rotation until the roller tappet is at the lowest point.



### Note

*Replace the seal.*

- Insert a new lubricated seal -2- into the high pressure pump groove -3-.
- Tighten the bolts hand-tight.
- Tighten the bolts diagonally to the tightening specification. Refer to ➔ [Fig. "High Pressure Pump - Tightening Specification and Sequence", page 394](#).
- Check the fuel system for leaks.

### Tightening Specifications

- ◆ Refer to ➔ [-6.1 High Pressure Pump", page 394](#)

## 6.3 High Pressure Pipe, Removing and Installing

Special tools and workshop equipment required



## 7 Heated Oxygen Sensor

⇒ [7.1 Heated Oxygen Sensor", page 401](#)

⇒ [O7.2 Oxygen Sensor, Removing and Installing", page 403](#)

### 7.1 Overview - Heated Oxygen Sensor



#### Note

- ◆ *Coat the new heated oxygen sensors with an assembly paste. This paste must not get into the slots of the heated oxygen sensor body.*
- ◆ *Only the threads on a used heated oxygen sensor may be coated with hot bolt paste. This paste must not get into the slots of the heated oxygen sensor body. Hot bolt paste. Refer to the ⇒ [Electronic Parts Catalog \(ETKA\)](#).*
- ◆ *The oxygen sensor wire must always be attached at the same location when installing. Do not let the wire connection come in contact with the exhaust pipe.*



## 7.2 Heated Oxygen Sensor, Removing and Installing

⇒ 07.2.1 Oxygen Sensor 1 after Catalytic ConverterGX7, Removing and Installing, page 403

⇒ 07.2.2 Oxygen Sensor 1 before Catalytic ConverterGX10, Removing and Installing, page 404

⇒ 07.2.3 Oxygen Sensor 2 Before Catalytic ConverterGX11, Removing and Installing, page 406

### 7.2.1 Oxygen Sensor 1 after Catalytic Converter -GX7-, Removing and Installing

The Oxygen Sensor 1 after Catalytic Converter -GX7- is composed of:

- ◆ Oxygen Sensor after Catalytic Converter -G130-
- ◆ Heater for Oxygen Sensor 1 after Catalytic Converter -Z29-

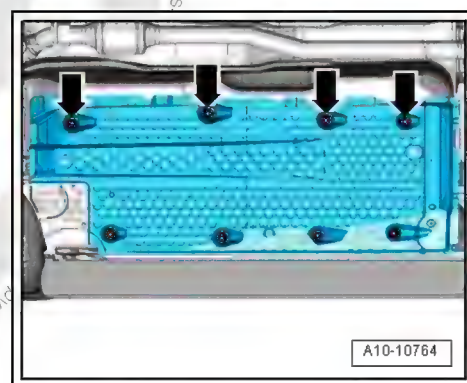
Special tools and workshop equipment required

- ◆ Ring Wrench 7-Piece Set -3337-

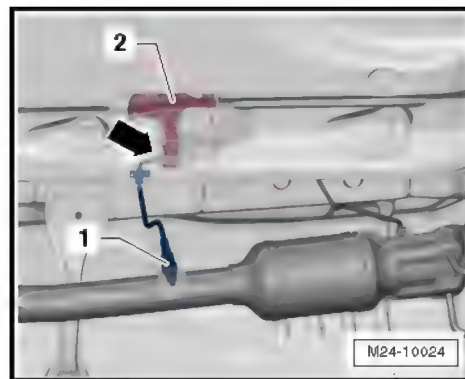


#### Removing

- Remove the nuts -arrows- from the right underbody panel and pull the underbody panel slightly downward.



- Unclip the connector -arrow- from the bracket -2- and disconnect it.



- Remove the Oxygen Sensor 1 after Catalytic Converter - GX7- -1- using a tool from the Ring Wrench 7-Piece Set -3337-.

### Installing

Install in the reverse order of removal while noting the following:



### Note

- ◆ Coat the new heated oxygen sensors with an assembly paste. This paste must not get into the slots of the heated oxygen sensor body.
- ◆ Only the threads on a used heated oxygen sensor may be coated with hot bolt paste. This paste must not get into the slots of the heated oxygen sensor body. Hot bolt paste. Refer to the ➔ Electronic Parts Catalog (ETKA).
- ◆ The oxygen sensor wire must always be attached at the same location when installing. Do not let the wire connection come in contact with the exhaust pipe.

### Vehicles from 07/2015

- When replacing a heated oxygen sensor, delete the adaptation values and adapt the heated oxygen sensor to the engine control module. Use the ➔ Vehicle diagnostic tester.
- Turn on the ignition and select the following menu items on the ➔ Vehicle diagnostic tester:

- ◆ Guided Functions
- ◆ 01 - Engine Electronics
- ◆ 01 - Heated Oxygen Sensors Adaptation

### Continuation for All Vehicles

### Tightening Specifications

- ◆ Refer to ➔ **-7.1 Heated Oxygen Sensor-**, page 401

## 7.2.2 Oxygen Sensor 1 before Catalytic Converter -GX10-, Removing and Installing

The Oxygen Sensor 1 before Catalytic Converter -GX10- is composed of:

- ◆ Heated Oxygen Sensor -G39-
- ◆ Oxygen Sensor Heater -Z19-

Special tools and workshop equipment required



## Note

- ◆ Coat the new heated oxygen sensors with an assembly paste. This paste must not get into the slots of the heated oxygen sensor body.
- ◆ Only the threads on a used heated oxygen sensor may be coated with hot bolt paste. This paste must not get into the slots of the heated oxygen sensor body. Hot bolt paste. Refer to the ➔ *Electronic Parts Catalog (ETKA)*.
- ◆ The oxygen sensor wire must always be attached at the same location when installing. Do not let the wire connection come in contact with the exhaust pipe.

## Vehicles from 07/2015

- When replacing a heated oxygen sensor, delete the adaptation values and adapt the heated oxygen sensor to the engine control module. Use the ➔ *Vehicle diagnostic tester*.
- Turn on the ignition and select the following menu items on the ➔ *Vehicle diagnostic tester*:
  - ◆ Guided Functions
  - ◆ 01 - Engine Electronics
  - ◆ 01 - Heated Oxygen Sensors Adaptation

## Continuation for All Vehicles

### Tightening Specifications

- ◆ Refer to ➔ *-7.1 Heated Oxygen Sensor*, page 401

## 7.2.3 Oxygen Sensor 2 Before Catalytic Converter -GX11-, Removing and Installing

The Oxygen Sensor 2 Before Catalytic Converter -GX11- is composed of:

- ◆ Heated Oxygen Sensor 2 -G108-
- ◆ Oxygen Sensor 2 Heater -Z28-

### Special tools and workshop equipment required

- ◆ Ring Wrench 7-Piece Set -3337-







## 26 – Exhaust System, Emission Controls

### 1 Exhaust Pipes/Mufflers

⇒ [1.1 Muffler", page 409](#)

⇒ [M1.2 uffler, Removing and Installing", page 410](#)

⇒ [S1.3 ystem, Installing without Tension", page 412](#)

⇒ [S1.4 ystem, Checking for Leaks", page 413](#)

⇒ [S1.5 leeve Installation Position", page 413](#)

#### 1.1 Overview - Muffler





#### 1 - Exhaust Pipe with Rear Muffler

- ☐ Removing and Installing. Refer to ➤ [M1.2 Muffler, Removing and Installing](#), page 410.
- ☐ Note the installation position

#### 2 - Bolt

- ☐ 25 Nm
- ☐ Replace after removing

#### 3 - Separating Point

- ☐ Center
- ☐ Identified on exhaust pipe by an impression
- ☐ Cut the exhaust pipe at a right angle at the separating point using the Body Saw - V.A.G 1523A- or Chain Pipe Cutter - VAS 6254-. Refer to ➤ [S1.5 Leave Installation Position](#), page 413.

#### 4 - Mounting Strap

- ☐ Fuel tank to body

#### 5 - Bolt

- ☐ Rear mounting strap to body
- ☐ Refer to ➤ Rep. Gr. 20; Fuel Tank; Overview - Fuel Tank.

#### 6 - Bolt

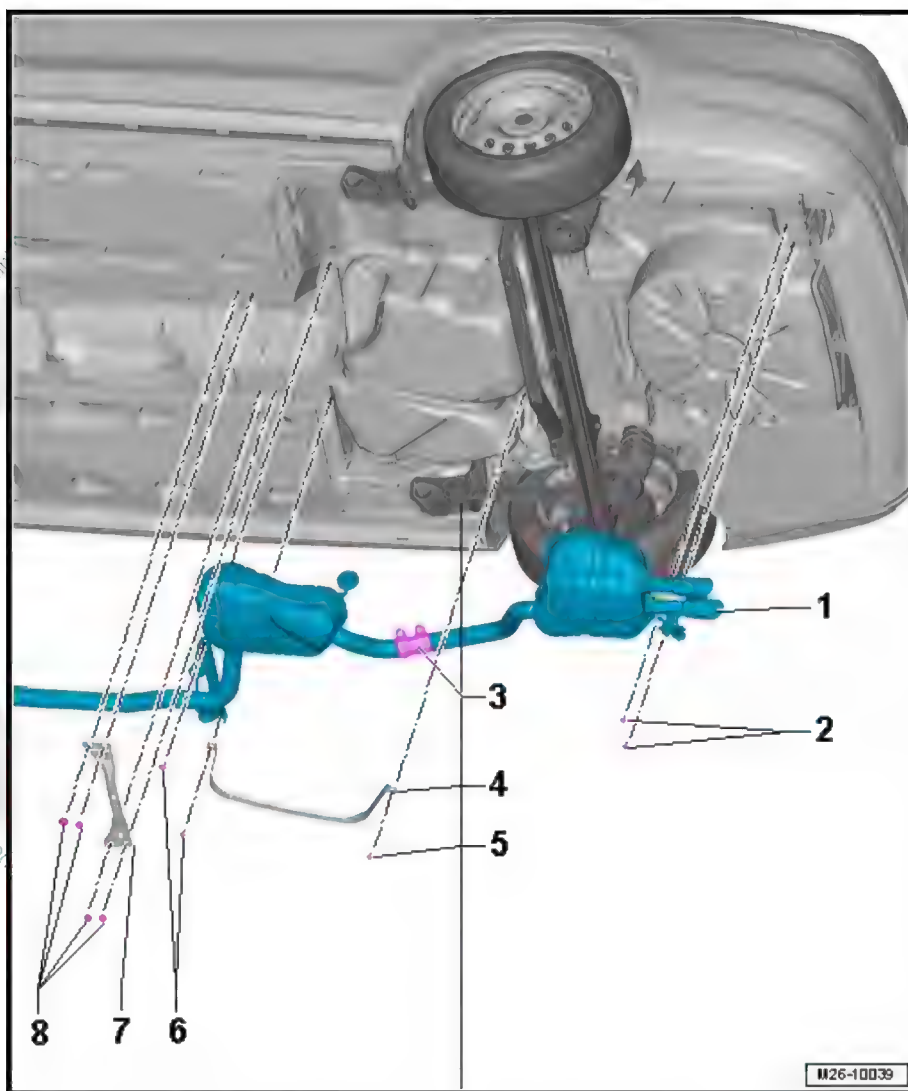
- ☐ Front tensioning strap to body
- ☐ Center muffler bracket to body
- ☐ Refer to ➤ Rep. Gr. 20; Fuel Tank; Overview - Fuel Tank.

#### 7 - Rear Tunnel Brace

- ☐ Removing and installing. Refer to ➤ Body Exterior; Rep. Gr. 66; Underbody Trim Panel; Tunnel Brace, Removing and Installing.

#### 8 - Nut

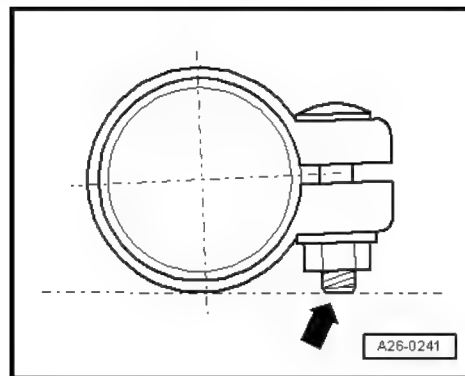
- ☐ 20 Nm
- ☐ Rear Tunnel Brace



## 1.2 Rear Muffler, Removing and Installing

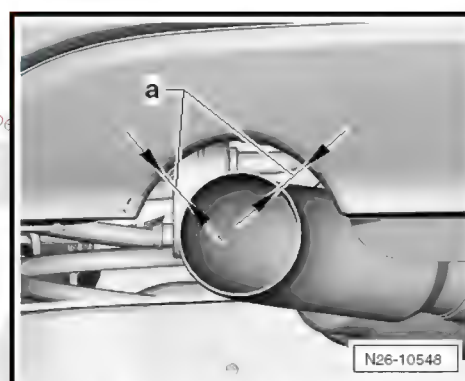
- ◆ A separating point has been provided in the connecting pipe for individual replacement of the center or rear muffler.
- ◆ The separating point is marked by an indentation around the circumference of the exhaust pipe.

Special tools and workshop equipment required



- Align the rear muffler without tension. Refer to ⇒ [Fig. “Tail Pipe, Aligning”](#), page 412 .

#### Tail Pipe, Aligning



- Align the tail pipe so that the dimensions -a- are equal.

Clamping sleeve installation position and tightening specification. Refer to ⇒ [S1.5 leeve Installation Position](#), page 413 .

### 1.3 Exhaust System, Installing without Tension

#### Procedure

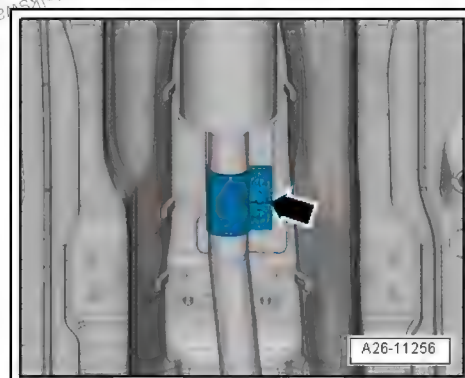
- Align the exhaust system when cold.



#### Note

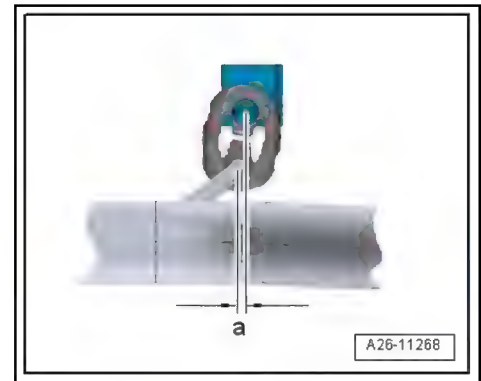
*The -arrow- points in the direction of travel.*

- Loosen the threaded connections for the front clamping sleeve -arrow-.

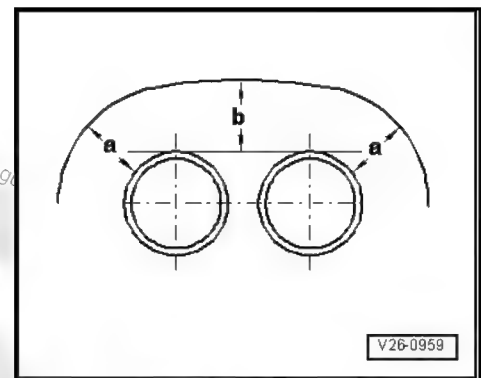




- Push the exhaust system far enough forward until the pre-tension on the retaining loops at the exhaust pipe -a- = 5 mm.



### Tail Pipes, Aligning



- Align the rear muffler so that the distance -a and b- between the bumper opening and the tail pipes is the same.
- Loosen the rear muffler to align the tail pipes.
- Install the clamping sleeve. Refer to ➤ [S1.5 leeve Installation Position](#), page 413 .

### Tightening Specifications

- ◆ Refer to ➤ [1.1 Muffler](#), page 409

## 1.4 Exhaust System, Checking for Leaks

### Procedure

- Start the engine and let it run at idle.
- Seal the tail pipes with cloths or plugs during the leak test.
- Check for leaks at the connection points from the exhaust manifold to the cylinder head and from the turbocharger to the front exhaust pipe.
- Repair the determined leaks.

## 1.5 Clamping Sleeve Installation Position

### Front Clamping Sleeve Installation Position



## 2 Emissions Control System

⇒ [-2.1 Emissions Control System", page 417](#)

⇒ [C2.2 onverter, Removing and Installing", page 419](#)

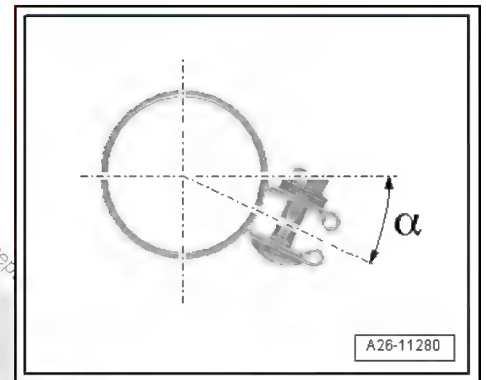
### 2.1 Overview - Emissions Control System





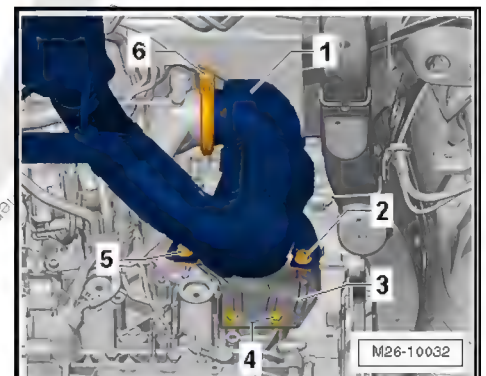
- ❑ Installation position. Refer to ➔ [Fig. ""Installation Position for Front Clamping Sleeve""](#), page 419 .

### Installation Position for Front Clamping Sleeve



- Install the clamping sleeve in the position shown.
- Angle - $\alpha$ - = approximately 20°.
- Threaded connection to the right.
- The nuts are toward the top.

### Installing the Catalytic Converter - Tightening Specification and Sequence



Step	Bolts and Nuts	Tightening Specification
1	<ul style="list-style-type: none"> <li>– Place the catalytic converter -1- on the turbocharger and loosely attach a new v-clamp -6-.</li> </ul>	
2	<ul style="list-style-type: none"> <li>– Loosely install the nuts -2, 4 and 5- by hand</li> <li>• Catalytic converter -1- and bracket -3- need to be able to move</li> </ul>	
3	<ul style="list-style-type: none"> <li>– Tighten v-clamp -6-</li> </ul>	15 Nm
4	<ul style="list-style-type: none"> <li>– Tighten all bolts and nuts.</li> </ul>	20 Nm

## 2.2 Catalytic Converter, Removing and Installing

Special tools and workshop equipment required



### 3 Secondary Air System

⇒ -3.1 Secondary Air System", page 425

⇒ S3.2 econdary Air Injection Pump MotorV101, Removing and Installing", page 427

⇒ S3.3 econdary Air Injection Solenoid ValveN112, Removing and Installing", page 427

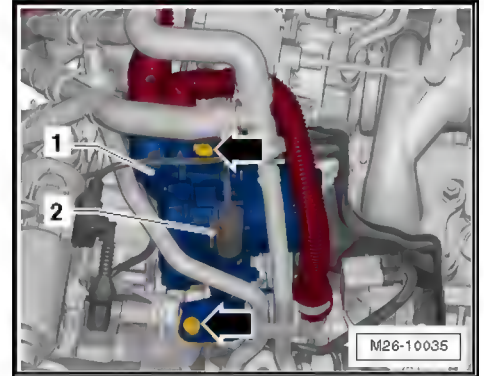
#### 3.1 Overview - Secondary Air System



### 3.2 Secondary Air Injection Pump Motor - V101-, Removing and Installing

#### Removing

- Remove the noise insulation. Refer to ➔ Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation.
- Disconnect the connector -2-.



- Remove the bolt from the heat shield on the secondary air injection pump -1-.
- Remove the -red- connecting pipes from the secondary air injection pump -1-. To do so, push the locking ring together on both sides.
- Remove both bolts -arrows- and remove the secondary air injection pump downward.

#### Installing

Install in the reverse order of removal while noting the following:

#### Tightening Specifications

- ◆ Refer to ➔ [-3.1 Secondary Air System", page 425](#)

### 3.3 Secondary Air Injection Solenoid Valve -N112-, Removing and Installing

- The flange must not be separated from the secondary air injection solenoid valve.
- Both the secondary air injection solenoid valve and the flange are replaced completely.

#### Removing

- Remove the noise insulation. Refer to ➔ Body Exterior; Rep. Gr. 66; Noise Insulation; Overview - Noise Insulation.
- Remove the catalytic converter. Refer to ➔ [C2.2 onverter, Removing and Installing", page 419](#) .
- Disconnect the connector -2-.



## 28 – Ignition/Glow Plug System

### 1 Ignition System

⇒ [1.1 Ignition System", page 429](#)

⇒ [D1.2 ata and Spark Plugs", page 431](#)

⇒ [C1.3 oils with Power Output Stages, Removing and Installing", page 431](#)

⇒ [K1.4 nock Sensor 1G61, Removing and Installing", page 434](#)

⇒ [P1.5 osition Sensor, Removing and Installing", page 435](#)

⇒ [E1.6 ngine Speed SensorG28, Removing and Installing", page 437](#)

#### 1.1 Overview - Ignition System



- ❑ Removing and Installing. Refer to ➤ [F2.2 lunge, Removing and Installing, Transmission Side](#)", page [122](#) .

### 13 - Transmission Side Sealing Flange

- ❑ Removing and Installing. Refer to ➤ [F2.2 lunge, Removing and Installing, Transmission Side](#)", page [122](#) .

### 14 - Engine Speed Sensor -G28-

- ❑ Removing and Installing. Refer to ➤ [E1.6 ngine Speed SensorG28, Removing and Installing](#)", page [437](#) .

### 15 - Bolt

- ❑ 4.5 Nm

## 1.2 Test Data and Spark Plugs

Engine Data	1.4L TFSI Engine
Ignition sequence	1-3-4-2
VW part number. Refer to <sup>1)</sup> .	Refer to the ➤ Electronic Parts Catalog (ETKA).
Spark Plug gap	0.65 to 0.75 mm
Tightening Specification	Refer to ➤ <a href="#">-1.1 Ignition System</a> ", page <a href="#">429</a>
Idle speed speed cannot be adjusted, it is regulated by idle stabilization	640 to 800 RPM
RPM limited by switching off fuel injectors and closing throttle valve	About 6500 RPM
Ignition timing is regulated by a control module. It is not possible to adjust the ignition timing.	
Ignition System	Single coil ignition system with four ignition coils (out- put stages integrated) that are connected directly to spark plugs via the ignition cables.

1) Refer to the ➤ Electronic Parts Catalog (ETKA) for the current spark plugs.

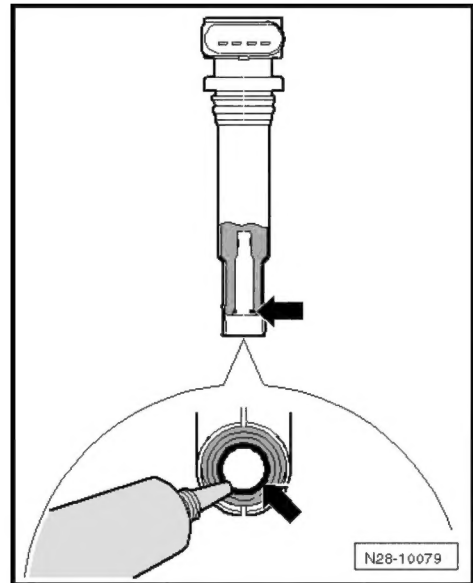
## 1.3 Ignition Coils with Power Output Stages, Removing and Installing

### Special tools and workshop equipment required

- ◆ Puller -T10530-







- Insert all ignition coils with the spark plug connector loosely into the spark plug shaft.
- Align the ignition coils to the connectors and connect the connectors all at the same time.
- Push the ignition coils evenly onto the spark plugs by hand (do not use a hammer).
- Install the engine cover. Refer to [⇒ C3 over](#), [page 106](#).

#### Tightening Specifications

- ◆ Refer to [⇒ -1.1 Ignition System](#), [page 429](#)

### 1.4 Knock Sensor 1 -G61-, Removing and Installing

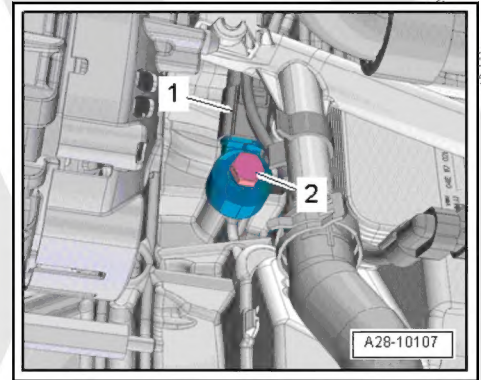
#### Removing

#### DANGER

Extremely dangerous due to high-voltage.  
Electrocution can cause death or very serious personal injury.

- Have the high-voltage system de-energized by a qualified person.

- Disable the high-voltage system. Refer to [⇒ Electrical Equipment](#); Rep. Gr. 93; High-Voltage System, Disabling.
- Remove the A/C compressor. Refer to [⇒ Heating, Ventilation and Air Conditioning](#); Rep. Gr. 87; A/C Compressor.
- Remove the coolant pump. Refer to [⇒ L2.4.1 ow Temperature Circuit Coolant Pump V468, Removing and Installing](#), [page 292](#).
- Disconnect the connector -1-.



- Remove the bolt -2- and then the Knock Sensor 1 -G61-.

#### Installing

Install in the reverse order of removal while noting the following:

- Install the A/C compressor. Refer to ⇒ Heating, Ventilation and Air Conditioning; Rep. Gr. 87; A/C Compressor.

#### **⚠ DANGER**

**Extremely dangerous due to high-voltage.**

**Severe bodily injury or death by electrocution is possible.**

- Have a qualified person put the high-voltage system back into service.

- Bring the high-voltage system back into operation. Refer to ⇒ Electrical Equipment; Rep. Gr. 93; High-Voltage System, Re-energizing.

#### Tightening Specifications

- ◆ Refer to ⇒ [-1.1 Ignition System", page 429](#)

### 1.5 Camshaft Position Sensor, Removing and Installing

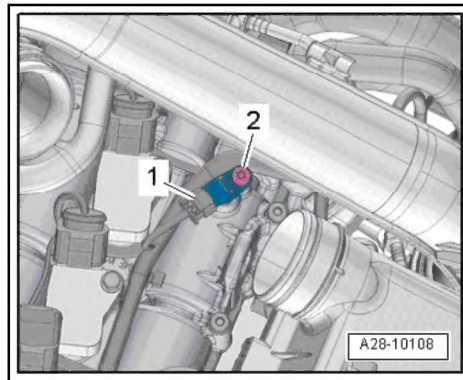
⇒ [C1.5.1 Camshaft Position Sensor G40, Removing and Installing", page 435](#)

⇒ [C1.5.2 Camshaft Position Sensor 3G300, Removing and Installing", page 436](#)

#### 1.5.1 Camshaft Position Sensor -G40-, Removing and Installing

##### Removing

- Remove the engine cover. Refer to ⇒ [C3 over", page 106](#) .
- Remove the resonator for the intake air scoop. Refer to ⇒ [A2.3 Intake Air Scoop Resonator, Removing and Installing", page 371](#) .
- Disconnect the connector -1-.



- Remove the bolt -2- and then remove the Camshaft Position Sensor -G40-.

#### Installing

- Install in the reverse order of removal while noting the following:
- Install the engine cover. Refer to [⇒ C3 over](#), page 106 .
- Check the seal for damage.



#### Note

- ◆ If damaged, replace it together with the Camshaft Position Sensor -G40-.
- ◆ The seal cannot be replaced separately.
- Connect the ⇒ Vehicle diagnostic tester.
- Turn on the ignition, and select and perform the following menu item on the ⇒ Vehicle diagnostic tester:
  - ◆ 01 - Engine electronics, functions
  - ◆ 01 - Basic setting
  - ◆ 01 Camshaft position sensor adaptation

#### Tightening Specifications

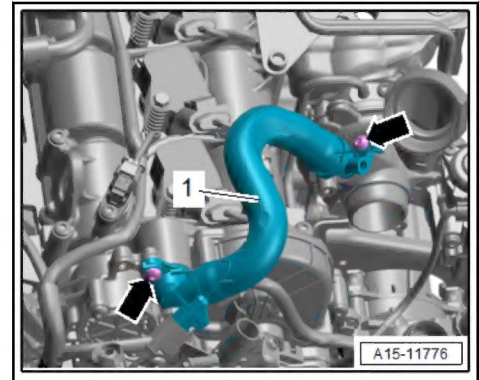
- ◆ Refer to [⇒ -1.1 Ignition System](#), page 429
- ◆ Refer to [⇒ -1.2 Camshaft Housing](#), page 149

### 1.5.2 Camshaft Position Sensor 3 -G300-, Removing and Installing

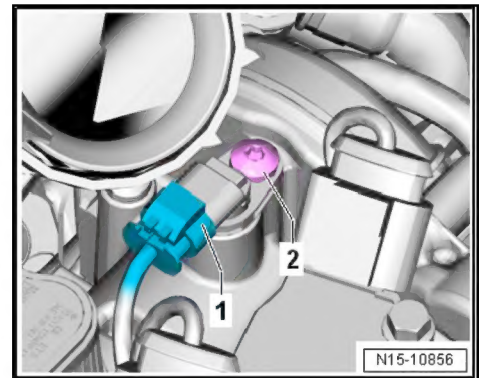
#### Removing

- Remove the engine cover. Refer to [⇒ C3 over](#), page 106 .
- Remove the resonator for the intake air scoop. Refer to [⇒ A2.3 in Scoop Resonator, Removing and Installing](#), page 371 .
- Remove the bolts -arrows- and then remove the crankcase ventilation hose -1-.





- Disconnect the connector -1-.



- Remove the bolt -2- and then remove the Camshaft Position Sensor 3 -G300-.

### Installing

Install in the reverse order of removal while noting the following:

- Check the seal for damage.



### Note

- ◆ If damaged, replace it together with the Camshaft Position Sensor 3 -G300-.
- ◆ The seal cannot be replaced separately.
- Connect the ⇒ Vehicle diagnostic tester.
- Turn on the ignition, and select and perform the following menu item on the ⇒ Vehicle diagnostic tester:
  - ◆ 01 - Engine electronics, functions
  - ◆ 01 - Basic setting
  - ◆ 01 Camshaft position sensor adaptation

### Tightening Specifications

- ◆ Refer to ⇒ -1.1 Ignition System, page 429
- ◆ Refer to ⇒ -1.2 Camshaft Housing, page 149

## 1.6 Engine Speed Sensor -G28-, Removing and Installing

Special tools and workshop equipment required